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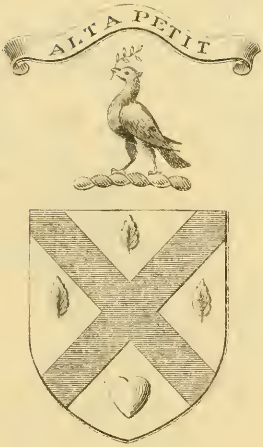

A. McL. Marshall

THE

JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

H. M. PHIPSON, C.M.Z.S.

AND

W. S. MILLARD.

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STATEMENT of ACCOUNT from 1st January, 1899, to 31st December, 1899.

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.
Balance in Bank on 1st January, 1899 ... ...Rs. 1,348 13 1				Rent of the Rooms from 1st December, 1898, to 30th Nov., 1899, at Rs. 125 per month...	1,500	0	0
Cash in hand on 1st January 1899 ... ... " 30 0 0				Establishment from 1st December, 1898, to 30th November, 1899	1,512	0	0
Petty Cash balance on 1st January, 1899 .. ... " 24 13 8				Library Account	54	14	0
	1,403	10	9	Furniture Account	41	4	0
Subscriptions for 1896 (in arrears)	30	0	0	Printing and Stationery	204	14	0
Do. for 1897 (do.)	45	0	0	Journal Account, cost of printing Journals and coloured Plates from England	8,030	8	9
Do. for 1898 (do.)	360	0	0	General Expenses	1,570	3	4
Do. for 1899	8,520	4	0	Balance in Bank on 31st December, 1899 ... ...Rs. 764 12 3			
Do. for 1900 (in advance)	445	8	0	Cash in hand on 31stDec., 1899 " 71 4 0			
Do. for Journal from Members residing out of India	592	1	8	Petty Cash balance on 31st December, 1899 ... ... " 14 12 9			
Do. for Life Membership	150	0	0		850	13	0
Entrance Fees	990	0	0				
Sale of Back Journals, &c.	1,068	13	10				
Interest on Government Paper	159	2	10				
Total ... Rs.	13,764	9	1	Total ... Rs.	13,764	9	1

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1899.		Rs.	a.	p.	1899.		Rs.	a.	p.
Jan. 1 ...	Balance of $3\frac{1}{2}$°/o Government Paper deposited with the Bank of Bombay	4,800	0	0	Dec. 31 .	Balance of $3\frac{1}{2}$°/o Government Paper deposited with the Bank of Bombay	4,800	0	0
	Rs. ...	4,800	0	0		Rs. ...	4,800	0	0

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Dunlop, H. H. G.	Hubli.
Dunn, G. W. O.	Karachi.
Dunsterville, Major K. S. (R.A.)	Simla.
Dunsterville, Capt. L. C.	Delhi.
Dupuis, A. L.	Ceylon.
Duthie, J. F. (F.L.S.)	Saharanpur.
Duxbury, G. R. (I.F.S.)	Poona.
Dwane, E. H.	Secunderabad.
Dyson, Major T. E. (I.M.S.)	Ahmedabad.
Eardley-Wilmot, S. (I.F.S.)	Rangoon.
Earle, A. A.	*Europe.*
Ebden, E. J. (I.C.S.)	*Europe.*
Ede, F. (A M.I.C.E.)	Silchar, Cachar.
Edgelow, Miss G.	*Europe.*
Edie, A. G. (I.F.S.)	Bandra.
Edmiston, W. L.	Kotagiri.
Edulji Nusserwanji, Dr.	Bombay.
Edwardes, S. M. (I.C.S.)	Bombay.
Egerton, C. F.	*Europe.*
Elliot, Capt. W. H. W. (F.L.S., I.M.S.)	South Africa.
Elliott, A.	Amraoti, Berars.
Elliott, Dr. A. M.	Bombay.
Elliott, C. F. (I.F.S.)	Lahore.
Elsworthy, E. H.	Bombay.
Elwes, Major E. V. (R.A.)	*Europe.*
Elwes, H. J. (F.R.S.)	*Europe.*
English, A. E. (I.C.S.)	Mogaung, Burma.
Enthoven, R. E. (I.C.S.)	Nasik.
Eunson, H. J. (C.E.)	Vizianagram.
Evans, Vety.-Capt. G. H.	Rangoon.
Evatt, C. B.	Delhi.
Fairclough, J.	*Europe.*
Farrington, H. A. (I.F.S.)	Jalpaiguri, Bengal.
Fawcett, C. H. (I.C.S.)	*Europe.*
Fenton, Lt.-Col. L. L.	Rajkote.
Ferguson, H. S. (F.Z.S., F.L.S.)	Trivandrum.

Fernandez, T. R.	Rajkote.
Ferrand, Lt.-Col. E. (I.M.S.)	Bangalore.
Ferreira, Miss C. (L.M. & S.)	Bombay.
Ferris, Lt.-Col. W. B.	Bombay.
Finlay, William	Jalpaiguri.
Finny, Capt. T. G. R.	Bombay.
Fischer, C. E. C. (I.F.S.)	*Europe.*
Fisher, W. F. D. (I.F.S.)	Thana.
Fitz-Hugh Lance, Lieut. F.	Loralai.
Fleming, W. N.	*Europe.*
Flower, Lieut. S. S.	Cairo, Egypt.
Foote, R. Bruce	Mysore.
Forbes, Capt. G. F. R.	Bombay.
Forbes, C. H. B.	Bombay.
Forbes, J. D.	Jabalpur.
Forbes-Sempill, The Hon'ble R. A.	Moulmein.
Forel, Monsieur Auguste (Hon. Correspg. Member).	*Europe.*
Forsyth, Dr. W.	Calcutta.
Forteath, H. H. (I.F.S.)	Pokokku, U. Burma.
Foster, Capt. L. M.	Kirkee.
Foulkes, George F. F. (I.F.S.)	Nellore.
Fox, C. P. (C.E.)	Gadag, S. M. Ry.
Fox, F. G. Brook (C.E.)	*Europe.*
Fox, Col. H. C.	Dharwar.
Fraser, Major A.	Mooltan.
Fraser, Capt. H. A. D. (R.E.)	*Europe.*
Fraser, S. M. (I.C.S.)	Bangalore.
French, Major G. B. (I.M.S.)	Azamgarh.
Frenchman, Major E. P. (I.M.S.)	Bassein, Burma.
Friedlander and Sohn, Messrs. R.	*Europe.*
Fry, T. B. (I.F.S.)	Belgaum.
Fuller, Hon'ble Mr. J. B. (I.C.S., C.I.E.)	Jabalpur.
Fulton, Hon'ble Mr. Justice E. M. (I.C.S.)	Bombay.
Fulton, Lt.-Col. R.	Dharamsala.
Furdoonji Jamsetji	Bombay.

Gabbett, E. (C.E.)	*Europe.*
Gadsden, F. O. (R.I.M.)	Bombay.
Gahagan, E. G. (C.E.)	Satara.
Gama, Dr. J. A. Da	Bombay.
Gamble, J. S. (F.L.S.)	*Europe.*
Gaye, W. C.	Secunderabad.
Gebbie, E. St. J., Mailang Division, B.-N. Ry.	N. Cachar.
Geddes, Mrs. J. G.	Poona.
Gell, H. G.	Bombay.
George, C. P.	Secunderabad.
Gerhardt, Paul	Bombay.
Ghosal, J. (I.C.S.)	Alibag.

Gibbs, H. M.	Bombay.
Gibbs, R. T.	Waltair, Madras.
Gilbert, C. F. (M.I.C.E.)	Bhamo, Burma.
Gilbert, Reg.	Bombay.
Gilbert-Cooper, W. J. (I.F.S.)	Moulmein.
Giles, R.	Karachi.
Gill, H.	Bombay.
Gimlette, Major G. H.S. (I.M.S.)	Indore, C. I.
Giro, C. G.	Bombay.
Gleadow, F. (F.R.M.S., I.F.S.)	Dehra Dun.
Godwin-Austin, H.	Ellichpur, Berar.
Goethals, Rev. Dr. Paul, Archbishop of Calcutta	*Europe.*
Goldsmid, F. L.	Ratnagiri.
Goldthorpe, Lieut. F. H.	*Europe.*
Gompertz, Rev. F. W.	*Europe.*
Gonsalves, Dr. J. F.	Bandra.
Gordon, D. M.	Mone, Burma.
Gore, Col. St. G. C. (R.E.)	Calcutta.
Græme, Col. R. C.	*Europe.*
Graham, J. A.	South Africa.
Graham, W. D.	Hongkong.
Gray, Chas.	Coonoor.
Gray, H.	Calcutta.
Greany, Lieut.-Col. J. P.	Poona.
Greatheed, C.	*Europe.*
Greaves, John	Bombay.
Green, E. Ernest (F.E.S.)	Peradeniya, Ceylon.
Green, Major J. S. (R.A.M.C.)	South Africa.
Green, W. M. (I.F.S.)	Kurseong, Bengal.
Greig, Joseph	Cachar.
Grubbe, Major E. A.	Meerut.
Guinness, Major E. (R.A.)	*Europe.*
Gurdon, Capt. B. E. M. (D.S.O.)	Chitral.
Guy, G. Filmer	Bombay.
Gwyn, Capt. A.	*Europe.*

Habibuddin, S. (C.S.)	Khamamett.
Haig, Lt.-Col. P. de H. (I.M.S.)	Mean Mir.
Haines, H. H. (I.F.S.)	*Europe.*
Hale, A.	Selangor.
Hall, Mitchell	Jalpaiguri.
Hamilton, R. E. A.	*Europe.*
Hampson, Sir George F. (Bart.), (F.L.S., F.E.S.)	*Europe.*
Hankin, A. C. (C.I.E.)	Secunderabad.
Hannyngton, W. O.	Pyinmana, Burma.
Hanson, C. O. (I.F.S.)	Seoni, Chapara.
Hanson, R. W.	Bombay.
Hardinge, D.	Maubin, Burma.

Hargrave, H. J. B. (C.E.)	*Europe.*
Harington, Lieut. E. C.	*Europe.*
Harington, Major V. (I.M.S.)	Ulwar.
Harold, Lt. C. F.	Zaila, Somali Coast.
Harper, E. W. (F.Z.S.)	Calcutta.
Harris, L. T.	Vizagapatam.
Harter, R. H.	Bombay.
Harvey, W. L. (I.C.S.)	Bombay.
Haslope, Rev. L. M.	Deesa.
Hasted, W. A.	Waltair, Madras.
Hatch, Capt. A. E.	Poona.
Hatch, Lt.-Col. W. K. (I.M.S.)	Bombay.
Hate, Vinayek N.	Bombay.
Hatherell, Capt. W. G.	Quetta.
Haughton, Samuel (C.C.S.)	Colombo, Ceylon.
Hauxwell, T. A. (I.F.S.)	*Europe.*
Hawks, Lieut. G. A.	Lucknow.
Hearsey, T. N. (I.F.S.)	Cuddapah, Madras.
Heath, R. H. (C.E.)	Bombay.
Heeckerenz, Le Baron Von (Hon. Corrpg. Member).	Java.
Henderson, Capt. R. S. F. (R.A.M.C.)	Deesa.
Henderson, Lieut.-Col. W. G. H. (I.M.S.)	*Europe.*
Herbert, Major H. (I.M.S.)	Bombay.
Hickman, R. St. J.	Cachar.
Hide, P.	Karachi.
Hildebrand, Lt. A. B. R. (R.E.)	*Europe.*
Hill, F. J. A.	Yellapur, Kanara.
Hill, H Charles	Dehra Dun.
Hla, Maung Po	Mingin, Burma.
Hodges, Capt. H.	*Europe.*
Hodgson, C. M. (I.F.S.)	*Europe.*
Hojel, Capt. J. G. (I.M.S.)	Bombay.
Hole, H. A.	Silchar, Cachar.
Holland, W. J.	*Europe.*
Hollis, T.	Bombay.
Hooton, Capt. A. (I.M.S.)	Poona.
Hope, C. W.	*Europe.*
Hope, G. A. (R.A.)	Ellichpur.
Hore, Lt.-Col. W. S.	*Europe.*
Hornidge, S. (C.E., I.F.S.)	Ahmednagar.
Hoskyn, Lt. J. C. M.	Baroda.
Howes, Mowbray	Selangore.
Howlett, Col. A. (I.S.C.)	Bhamo, Burma.
Hudson, Capt. C. T. (I.M.S.)	Bombay.
Hudson, C. W. M. (I.C.S.)	Ahmednagar.
Hudson, L. S.	*Europe.*
Hunt, C. B. Holman	Ceylon.
Hunt, E. R.	*Europe.*
Hunter, Lt.-Col. J. M.	Rajkote.

Hunter, Lt. W. J. H.	Poona.
Hutchinson, Lt. C. G.	Bampon, S. Shan States.
Hutchinson, F. G.	Bhaynder.
Hutchinson, F. T.	Bombay.
Hyam, Judah (Life Member)	Poona.
Hyde-Wilcox, F.	Calcutta.

Ichalkaranji, The Hon'ble Narayenrao Govind, *alias* Babasaheb Ghorpade, Chief of (Life Member)	Kolhapur.
Imray, Robt. S.	Peermaad, Travancore.
Indore, H. H. the Maharaja Holkar of	Indore.
Inglis, Chas. M.	Darbhanga.
Inverarity, J. D. (B.A., LL.B.) (Life Member)	Bombay.

Jackson, A. B. (I.F.S.)	Nilamber, Malabar.
Jackson, Col. F. H.	*Europe.*
Jacob, Mrs. Arthur	Mhow, C. I.
Jacob, G. (I.C.S.)	Ahmednagar.
Jamrach, W.	*Europe.*
Jamsetji, M., Doctor	Bombay.
Janjira, H. H. Sir Sidi Ahmed Khan, Nawab of (Life Member)	Janjira.
Jardine, A. J. A.	Bangkok, Siam.
Jardine, E. R.	Rangoon.
Jardine, W. F.	Ratnagiri.
Jayakar, Lt.-Col. A. S. G. (I.M.S.)	Muscat.
Jeffrey, J. A.	Bombay.
Jermyn, Capt. T.	Peshawar.
John, H. C. (C.E.)	*Europe.*
John, H. E.	Bombay.
Johnson, S. M.	Cawnpore.
Johnson, W. P.	Bombay.
Jones, Major F. W. C. (R.A.M.C.)	Kandia, Crete.
Jones, Major J. M. (R.A.M.C.)	Deolali.
Jones, Major J. Lloyd (I.M.S.)	Bombay.
Jones, Capt. M. D. Goring	Mandalay.
Jowitt, John F.	Bandarwella, Ceylon.
Jugmohundas V. Bhaisett	Bombay.

Kearns, A. S.	Bangalore.
Keary, Lt.-Col. H. D	Meiktila, Burma.
Keene, Lt. C. W.	Peshawar.
Kellie, Col. R. H.	Deolali.
Kelsall, Capt. H. J. (R.A.)	Rangoon.
Kemball, H. V. (C.E.)	Poona.

Kondall, Capt. C. J. (R.I.M.)	Bombay.
Kennedy, R. M. (I.C.S.)	Belgaum.
Kenny, S. D. (I.F.S.)	Chikalda Berar.
Kenyon, James	Karachi.
Ker, L. B.	Bombay.
Kerkhoven, E. J. (Hon. Correspg. Member)	Java.
Keys, H. W. (I.F.S.)	Satara.
Khan, Muncherji Framji	Bombay.
Khareghat, M. P. (I.C.S.)	Ratnagiri.
King, Alfred	*Europe.*
Kinsman, F.	Calcutta.
Kirtikar, Lt.-Col. K. R. (I.M.S.)	Ratnagiri.
Knight, D.	Cawnpore.
Kolhapur, H. H. the Maharaja of (Life Member)	Kolhapur.
Kotah, H. H. the Maharaja	Kotah.
Kunwar Kushal Pal Singh	Narki, Agra Dist.

Lace, John H. (I.F.S., F.L.S.)	Simla.
Lachlan, Capt. E. M. (R.A.)	Kirkee.
Laird-MacGregor, E. G. L. (I.C.S.)	Karwar.
Lamb, Capt. Geo. (I.M.S.)	Bombay.
Lamb, R. A. (I.C.S.) (Life Member)	Ahmednagar.
Lambert, J. S.	Munmar.
Land Records and Agriculture, The Director of	Poona.
Lang, Walter	Bombay.
Langley, Brig.-Surg. E. H.	*Europe.*
Lathi, H. H. the Thakore Sahib of (Life Member)	Lathi.
La Touche, Lieut.-General C. D.	*Europe.*
Lawrence, Mrs. E.	Thana.
Leask, J.	Bombay.
Lee, Lieut. A. W. H.	Sima, Upper Burma.
Lee, P. Henry K.	Bangalore.
Lees, John	Cachar.
Leggett, S. P.	Karachi.
Leighton, D. E. W.	Madras.
Lely, Hon'ble Mr. F. S. P. (I.C.S.)	Ahmedabad.
Lennox, Lt. G. M.	Bombay.
Leslie, A. K.	Bombay.
Lester, Capt. C. D.	Quetta District.
Lowis, Fred (F.L.S.)	Colombo, Ceylon.
Light, Lt-Col. R. H.	*Europe.*
Light, Lieut. W. A.	*Europe.*
Lightfoot, S. St. C.	Minbu, U. Burma.
Lindesay, Major E.	Mhow, C. I.
Lindgren, O.	*Europe.*
Linnell, Fred.	Rangoon.
Little, F. A.	*Europe.*
Littledale, Professor H.	*Europe.*

Lloyd, Col. R. O. (R.E.)	Poona.
Loam, Mathew	*Europe.*
Loch, Capt. F. R. E. (I.S.C.)	Bombay.
Loch, Col. W. W.	Nepal.
Long, A. M.	Raipur.
Long, G. R. (I.F.S.) (Life Member)	Moulmein.
Lovegrove, W. H. (I.F.S.)	Kotedwara.
Lowndes, G. R.	Bombay.
Lowrie, A. E. (I.F.S.)	Coorg.
Luard, E. S.	Bombay.
Lucknow, The Curator & Sec., Provincial Museum	Lucknow.
Lumley, Major F. D.	South Africa.
Lye, Rev. S. L.	*Europe.*
Lynch, C. B.	Bombay.
Lynn, G. R. (C.E.)	Baroda.
Lyons, Major R. W. S. (I.M.S.)	Bombay.

Macaulay, L. A.	Bombay.
Macaulay, R. H.	Bombay.
MacCartie, Major F. (I.M.S)	*Europe.*
MacDonald, Dr. D. (Life Member)	Bombay.
MacDonald, J.	Bombay.
MacDonald, K. C.	Myingyan, Burma.
MacDonald, P. J.	Calcutta.
MacMillan, D. A.	Keonjhar, Orissa.
Mackenzie, Kenneth	Kurnool, Madras.
Mackenzie, Lt. K. L. W.	Poona.
Mackenzie, M. D.	Jacobabad.
Mackenzie, M. M.	Chapra.
Mackenzie, T. D. (I.C.S.)	*Europe.*
Mackinnon, P. W. (F.E.S.)	Mussoorie.
Maclean, Jas.	China.
Macleod, N. C.	Bombay.
Maconachie, Lt.-Col. G. A. (I.M.S.)	*Europe.*
Macpherson, John	Bombay.
Macpherson, Col. T. R. M.	*Europe.*
Mactaggart, H. B.	Negapatam.
Macwood, F. M.	Colombo.
Madras, The Supdt., Govt. Central Museum	Madras.
Mahaluxmiwalla, K. D.	Bombay.
Mair, A.	Calcutta.
Maitland, Major C. B. (I.M.S.)	Poona.
Mallins, Major C. (I.M.S.)	*Europe.*
Manders, Major N. (R.A.M.C.)	Colombo.
Mandlik, Narayan V. (Life Member)	Bombay.
Manson, C. E. F.	Pyinmana, Burma.
Manson, F. B. (I.F.S.)	Rangoon.
Mant, R. N.	Bombay.

Maries, Chas. (Hon. Correspg. Member)	Gwalior.
Marjoribanks, Lt. J. L. (I.M.S.)	Erinpura.
Marshall, Capt. T. E. (R.A.)	Quetta.
Marston, G. D. (C.E.)	Bombay.
Marten, James	Dehra Dun, N.-W.P.
Martin, Lieut.-Col. Gerald (Life Member)	*Europe.*
Masson, D. P. (C.I.E.)	Lahore.
Massy, Major H. S.	Loralai.
Mathew, Lt. C. M. (I.M.S.)	Bangalore.
Maxwell, F. D.	Maubin, Burma.
McArthur, Vet.-Surgn. G. W.	Rangoon.
McClelland, W. S. (M.I.C.E.)	*Europe.*
McGlashan, John (C.E.)	Bombay.
McIntosh, Alex. (C.E.)	Shenkottah P. O., Madras Presidency.
McIntosh, H. J. (I.C.S.)	Calcutta.
McIntosh, R. (I.F.S.)	Madanapally.
McKay, Lt.-Col. H. K. (I.M.S.)	Jabalpur, C. P.
McKee, J. A. (I.F.S.)	Nagpur, C. P.
McKenzie, Alex.	Bombay.
McMullen, Dr. G. C.	Kotri, Sind.
McNair, Major J. F. A. (C.M.G.)	*Europe.*
McNeil, J. (I.C.S.)	Dharwar.
Mead, Capt. H. R.	Deolali.
Mead, P. J. (I.C.S.)	Ahmedabad.
Meade, Lt.-Col. M. J.	Bushire.
Meinertzhagen, Lieut. R.	Nusseerabad.
Merrony, Chas.	Godhra.
Merwanji Pallonji Talati	Bombay.
Messent, P. G.	Bombay.
Meyer, Major C. H. L. (I.M.S.)	Bombay.
Meyer, O.	Bombay.
Middleton, T. H.	*Europe.*
Millard, W. S.	Bombay.
Millett, G. P. (I.F.S.)	Nasik.
Milne, Capt. C. J. (I.M.S.)	Calcutta.
Minniken, G. G. (I.F.S.)	Lahore.
Miraj, Shrimant Gungadharrao Ganesh, *alias* Babasaheb Patwardhan, Chief of (Life Member)	Miraj.
Mitchell, Dr. W.	*Europe.*
Modi, Bomanji Edulji	Kaira.
Moir, E. McArthur (I.F.S.)	*Europe.*
Monté, Dr. D. A. de	Bandora.
Morgan, A.	Kotagiri.
Morgan, Lt. E. J. (I.M.S.)	Bombay.
Morison, A. E. F.	Kotagiri.
Morison, W. T. (I.C.S.)	Bombay.
Morris, Capt. D. O.	Amraoti, Berar.
Morton, Lieut. J. P. (I.M.S.)	*Europe.*

Moscardi, E. H. (I.C.S.)	Surat.
Moss, Capt. C.	*Europe.*
Mosse, Lt. A. H. E. (I.S.C.)	Mhow, C. I.
Moulvi Syed Ali Belgram	Hyderabad.
Moylan, W.	Calcutta.
Muir, Col. H. S. (I.M.S.)	*Europe.*
Muller, Professor O. V.	*Europe.*
Mumford, E. G.	Maubin, Burma.
Mure, J. S.	Lahore.
Murray, W.	Bombay.

Nagpur, The Curator, Central Museum	Nagpur.
Nangle, Lieut. K. E.	Bombay.
Naranji Dwarkadas (Life Member)	Bombay.
Narrotumdas Morarji Goculdass (Life Member)	Bombay.
Navanagar, H. H. Maharaja Jam Saheb of	Rajkote.
Newland, Major A. G. E. (I.M.S.)	*Europe.*
Newnham, Capt. A. (F.Z.S.)	Nasirabad.
Nicéville, L. de (F.E.S.) (Hon. Correspg. Member)	Calcutta.
Nicholson, E. F.	Bombay.
Nicholson, Major R. H. (R.A.M.C.)	*Europe.*
Nisbett, Lieut. W. G.	Bhamo.
Northcote, H. E., Lord	Bombay.
Nurse, Capt. C. G. (F.R.G.S., F.E.S.)	*Europe.*
Nurse, Capt. H. H.	Quetta.

Oakes, George	Ootacamund.
Oates, E. W. (Hon. Correspg. Member)	*Europe.*
O'Brien, Edward	Amreli, Kathiawar.
O'Brien, Hon'ble W. T.	Karachi.
O'Callaghan, I.	*Europe.*
O'Connell, J.	*Europe.*
O'Conor, J. E. (C.I.E.)	Calcutta.
O'Leary, J. L. McCarthy (I.F.S.)	Kurnool.
Ogilvie, Capt. E. C. (R.E.)	Quetta.
Oldham, F. T. (R.A.)	*Europe.*
Olivier, Lt.-Col. H. D. (R.E.) (Life Member)	Bombay.
Ollivant, Hon'ble Sir E. C. K. (I.C.S., K.C.S.I.)	Bombay.
Ommanney, H. T. (I.C.S.)	*Europe.*
Opiumwalla, Dorab E.	Bombay.
Orr, J. P. (I.C.S.)	Poona.
Osmaston, B. B. (I.F.S.)	Chakrata, N.-W. P.
Osmaston, L. S. (I.F.S.)	Poona.
Ozanne, E. C. (I.C.S.)	*Europe.*

Palliser, H. G. (C.E.)	Karachi.
Parker, Lt.-Col. J. (I.M.S.)	Bombay.
Parmenides, John	*Europe.*

Parratt, F. E. H.	Chiengmai.
Parsons, Hon. Mr. Justice	Bombay.
Partridge, Henry (Life Member)	Pyinmana, Burma.
Pawalla, Jamsetji C.	Bombay.
Pearless, S. H.	Ceylon.
Pearse, Capt. A. (I.M.S.)	*Europe.*
Pearson, E. H. M.	*Europe.*
Pearson, Mrs. H. C.	Castle Rock.
Pearson, R. S. (I.F.S.)	Dhulia.
Pechey-Phipson, Mrs. (M.D.)	Bombay.
Peet, A. W. (I.F.S.)	*Europe.*
Peile, Capt. A. J. (R.A.)	Bombay.
Peiniger, W. G.	Chiengmai, *viâ* Moulmein.
Pelly, C. B. N.	Madras.
Pemberton, E. S.	Marmagoa.
Penton, John E.	Broach.
Pestonji Jivanji	Karemnagar, Yelgundal District.
Peters, Lt.-Col. C. T. (I.M.S.)	Bombay.
Petit, Bomanji Dinshaw (Life Member)	Bombay.
Petit, Jehangir Bomanji (Life Member)	Bombay.
Petters, J. McF. (O.E.)	Myitkyina, Burma.
Phelps, E. L.	*Europe.*
Phillips, Mrs.	*Europe.*
Phillott, Major D. C.	Kohat.
Phipson, H. M. (C.M.Z.S.) (Life Member)	Bombay.
Pilcher, Capt. A. J. (R.E.)	*Europe.*
Pilcher, Col. J. G. (I.M.S.)	*Europe.*
Pilkington, H. S. H.	Bombay.
Pinhey, Capt. A. F.	Sutna.
Pink, H. F. L.	Dehra Dun.
Plinston, G. C.	Bombay.
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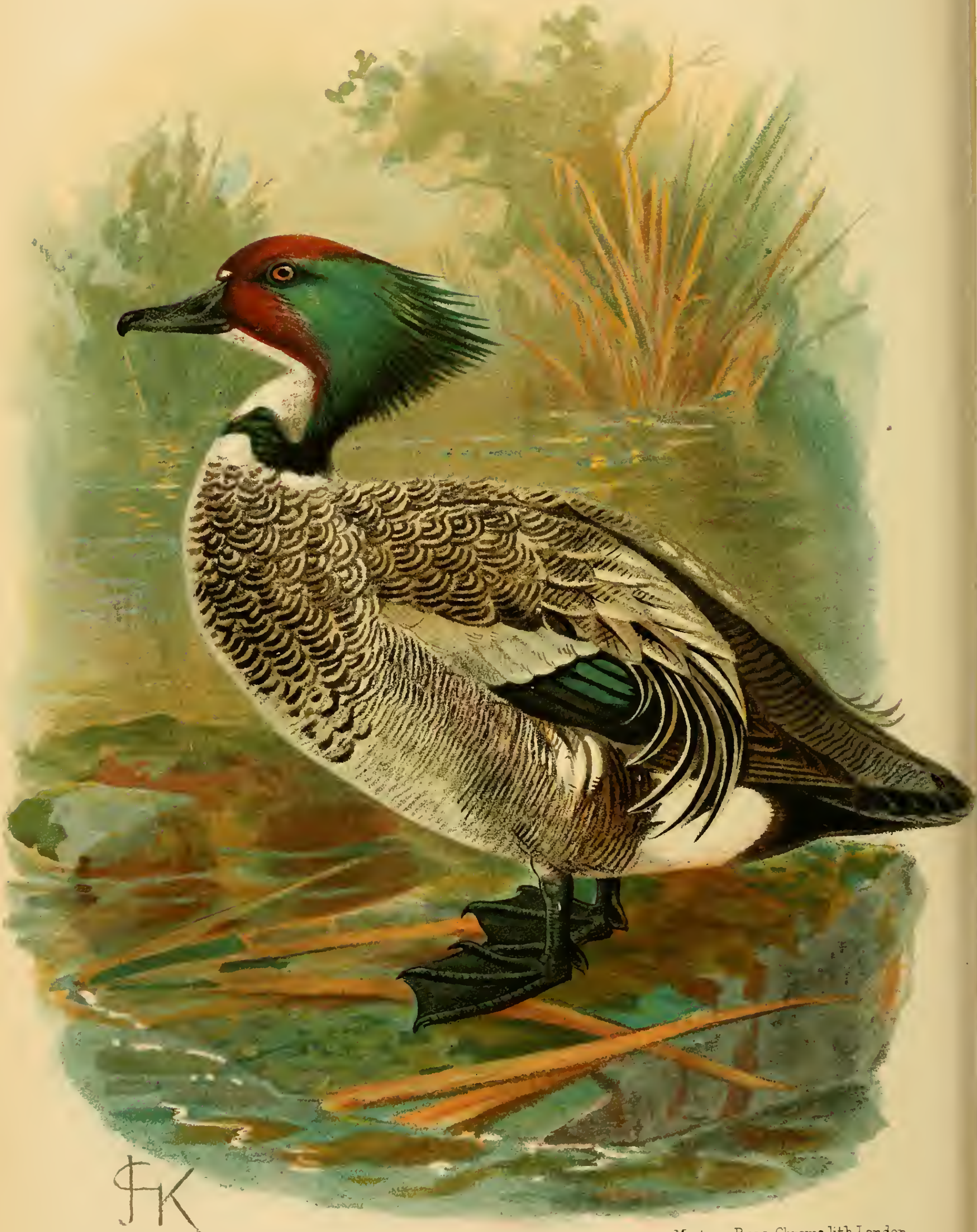

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THE CRESTED OR BRONZE-CAPPED TEAL.

Eunetta falcata.

½ Nat. size

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Vol. XII. BOMBAY. No. I.

INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F. Z. S.

Part V, with Plate V.

(*Continued from p. 584 of Vol. XI.*)

Genus ANAS.

This genus contains seventeen species, some of which are practically cosmopolitan and others confined to comparatively small areas. India possesses but two species, *Anas boscas* and *A. pœcilorhyncha*, the former of which is cosmopolitan, whereas the other belongs to our local avifauna. The genus is recognized by its broad but not spatulated bill, which is about the length of its head ; moderate tail, of which the central tail feathers are not lengthened ; its non-chestnut inner secondaries and dark grey wing coverts.

Key to Species.

Speculum purple-blue or violet ; no white on outer webs of inner secondaries ... ... (1) A. boscas.
Speculum metallic-green ; outer web of inner secondaries more or less white ... ... (2) A. pœcilorhyncha.

(19) Anas boscas.

The Common Wild Duck or Mallard.

Anas boschas, Jerdon, "Birds of India," III, p. 398 ; Hume, "Nests and Eggs," p. 642 ; *id.*, "Str. Feath.," I, p. 261 ; Scully, *ibid*, IV.,

p. 199 ; Hume, *ibid*, VIII, p. 119 ; *id.*, Cat. No. 158 ; Barnes, "Birds of Bombay," p. 402.

Anas boscas, Hume and Marshall, "Game Birds of India," III, p. 151 ; Hume, "Nests and Eggs" (2nd ed.), III, p. 288 ; Salvadori, "British Museum Cat.," XXVII, p. 189 ; Blanford, "Birds of India," IV, p. 435.

Description of Adult Male.—Head and upper neck bright and very glossy dark green ; a ring, interrupted on the nape, pure white ; upper back and scapulars brownish-grey, changing into dark brown on the back and lower neck ; upper back vermiculated with dark brown ; rump and upper tail coverts and four central rectrices deep black ; outer rectrices light grey, edged white. Wing coverts dark grey or grey-brown, the greater coverts tipped black and sub-tipped white, forming two distinct wing bars ; speculum glossy bluish-purple or violet ; after this two more bars formed by the black sub-tips and white tips of the outer secondaries ; exposed inner secondaries dark brown, remaining quills dark brown ; upper breast chestnut ; lower breast, flanks, and abdomen greyish-white, very finely barred with dark brown ; under tail coverts rich black.

"The colours of the soft parts vary. I have found the legs and feet most commonly reddish-orange, but also coral and vermilion-red, and again pure orange ; the claws are black or dusky, and more or less of the webs are often more or less dusky ; the irides are brown, sometimes deep, sometimes comparatively light ; the nail of the bill is black ; the rest of the bill is normally a rather dingy olive, more yellow at base, greener at tip ; the lower mandible is generally more or less orange at the base ; and I have killed birds (females), with the bills black on the culmen and a considerable portion of the upper mandible and orange-yellow elsewhere ; others with brown replacing the black, and brownish-yellow replacing the orange ; and I killed one male with the bill a distinct orange-green—a colour such as I never saw in any other bird."—(Hume.)

"Bill yellowish-green, black at tip ; under mandible reddish-yellow at the base ; irides brown ; legs and feet reddish-orange."—(Salvadori.)

Adult Male in non-breeding plumage.—Similar to the female, but usually a good deal darker.

"Length 22·3″ to 24·5″ ; wing 10·45″ to 11·3″ ; tail from vent 4·2″ to 4·8″ ; tarsus 1·6″ to 1·85″ ; bill from gape 2·5″ to 2·75″ ; weight if in fair condition 2 lbs. 8 oz. to 3 lbs., but I have shot them up to 4 lbs."—(Hume.)

"Total length about 24 inches; wing 10·50″ to 11·50″; tail 4·41″ culmen 2·2″; tarsus 1·85″."—(Salvadori.)

Female.—Chin and throat pale buff; remainder of upper and lower parts dark brown with buff edges; on the lower parts the brown centres are reduced to streaks only; rectrices brown, edged with pale buff; wings as in the male.

The depth of the brown and its tint vary much, as does the boldness of the edging. In some birds the centres and edges blend into one another, whilst in others they constrast very distinctly.

Length 20·0″ to 21·75″; wing 9·2″ to 10·8″; tail from vent 4·1″ to 4·7″; tarsus 1·5″ to 1·7″; bill from gape 2·47″ to 2·63″; weight (as above) 1 lb. 10 oz. to 2 lbs. 10 oz.

"*Young in first plumage* resembles adult female, but the male is somewhat darker in colour."—(Salvadori.)

"Young in down has the upper parts dark brown, with nearly white spots on the wings, scapulars, and sides of the rump; the under parts are pale brown, palest on the belly, and shading into buff on the throat; it has a buff stripe over the eye, a dark brown stripe through the eye, and a dark spot at the end of the ear coverts."—(Seebohm.) Waterton, as quoted by Hume, describing the change of plumage in the drake into its post-nuptial plumage, says: "At the close of the breeding season the drake undergoes a very remarkable change of plumage. About the 24th of May the breast and back of the drake exhibit the first appearance of a change of colour. In a few days after this the curled feathers above the tail drop out, and grey feathers begin to appear amongst the lovely green plumage which surrounds the eyes. Every succeeding day now brings marks of a rapid change. By the 23rd June scarce one single green feather is to be seen on the head and neck of the bird. By the 6th of July every feather of the former brilliant plumage has disappeared, and the male has received a garb like that of the female, though of a somewhat darker tint. In the early part of August this new plumage begins to drop off gradually; and by the 10th of October the drake will appear again in all his rich magnificence of dress."

Salvadori thus defines the habitat of the Mallard: "Northern Hemisphere, rarely north of the Arctic circle; in Africa extending from the Azores, Madeira, and Canaries on the west to Nubia and Abyssinia (Rüppel) on the east ; in Asia during the winter found from Arabia, through Persia and North India to China and Japan ; in America extending southwards to Mexico, the West Indies ; and Central America as far as Panama."

Narrowing ourselves to our own Indian limits, we find that *A. boscas* is very common only in the extreme north and north-west ; it is a constant but less numerous visitor to the whole of the North-West Provinces, Punjab and Oudh ; and south of this is decidedly rare. It has been shot occasionally in Rajputana ; and also in the Central Provinces and in Bombay. It is met with at odd times and places throughout Bengal and Assam ; and I have myself shot a pair in Jessore which were in company with a few Gadwall. They were extremely wild, as were all the ducks, and it was only with considerable difficulty they were approached and shot. It is not very rare in Cachar, and is occasionally to be seen in Sylhet. I shot one out of a small flock in Gowhatty in December,1886, and have had notices of them from Dibrughur, Sadya, Tezpur, and Naogaon. From Manipur the only record I have is that of Surgeon-Captain Woods, who writes : " The mallard is extremely rare in Manipur ; in fact, during the last seven years I have only seen a pair, and that was this year about the 10th of January. These two birds were along with a large flock of teal in a small jheel lying about eight miles due north of Imphal. I tried hard to secure them, but they were very wild and flew away at the first shot. I returned to the jheel next day, but could find no signs of them. I also saw a pair on a small jheel in the Namba forest " (Assam). Lately two notices of its appearance in Burma have been made in the " Asian." The notices, though initialled and not signed in full, appear to be authentic. One mallard is recorded as being part of a huge bag of duck and teal obtained near Mandalay.

In Kashmir they are extremely common, as may be seen from the following well-written cutting from the "Asian" of the 8th of February by the pen of " A. E. W." :—" On January, the 18th, I was shooting at a marsh near the big reserve, having in front of me about five or six acres of open water and a smaller amount about five hundred yards behind. The reserve was also being shot by four guns, so that the ducks were being continually driven towards me. I knew if I could once get my punts through the ice I should be in for a good thing. For an hour-

and a-half we laboured to get through. By dint of using two heavy poles we reached the place, and then broke up sufficient of the ice to picket out four decoy ducks, two mallards, and five tame ducks which were accustomed to be shot over. The punt was hidden by some grass, and in it I lay on my back with my shoulders propped up by a large sack of grass ; there was not sufficient cover to enable me to hide if I had sat up ; in fact, I had to supplement the little there was by some reeds which a fisherman took off his roof and sold to me.

"I could see thousands of ducks on the water in front, looking like a black mass, whilst the edge of the ice was lined with many more. By the aid of glasses I could make them out to be chiefly mallards and red-crested pochards ; of course those birds which had been behind and tolerably close had cleared off. The second punt was sent back by the way we came, and was then carried round by land to where the open water touched the edge of the marsh. In the middle of the pond in front was a small island ; on to this a hardy duck shikari managed to get and then lay hid ; his orders were to hide, and when the ducks had settled to put them up. In addition to the advantages of my post I was immediately in the line of flight between the Hokasai and Anchar lake.

"I had started early ; the Hokasai party were to begin at noon ; but I had not been long in position before the fun began. Thousands streamed over and many pitched on my marsh, but as they came to the right I could not do much when reclining on my back ; soon they began to fly backwards and forwards over my head, and this they continued to do for hours. . . . . I counted over 80 birds down before I sat up to eat my lunch. They were on the ice in every direction ; two or three fell so close that I could gather them from the boat ; one fell into my cartridge box. Whilst eating and having a smoke the birds were flying round, but were left to their own ways ; and then I lay down again, the ice had thawed in places, and the wounded birds wandered away. I stopped all I could reach, but that was not many. In the afternoon the teal began to fly round and looked for open water, but none of the big flights would come near me. Single birds came at short intervals ; my cartridges were nearly finished ; so I whistled for the men, but they could not hear me ; the shooting on Hokasai ceased, and nearly all the ducks left ; now and again a mallard or gadswall came flying round the decoys, and fell an easy prey to the . . . powder.

"My men did not remember how long it would take to reach me; consequently it was nearly dark before I could begin to move, and then the birds had to be gathered. We collected in all 96, but had to leave many, for they waddled over the ice and got into pools separated from us by thick ice and reeds frozen hard together. Curiously enough not a single red-crested pochard came to the gun; but 53 mallard were amongst the slain, and very grand they looked when put in a line on the deck of the house-boat."

In Sind, in the cold weather only of course, the Mallard is found in as great numbers as in Kashmir. Here it is said to collect in flocks of some hundreds; but this is not usual, and all over its vast range it will be found more often in small than in large flocks.

About a dozen to some twenty or so is perhaps the number most often seen together in one flock, and over forty or fifty is well above the average, whilst flights numbering a hundred will seldom be seen.

They often too are found merely in pairs, whether in the hot plains of India or in our own cool island. Many, if not most of us, must have, while wandering along some half-frozen brook, or wholly frozen broad, put up a pair of wild duck from some sheltered place beneath a tree or thick cluster of reeds. Generally, even in the depth of winter, they keep to open water, be it a pool ever so small; but I have seen them disconsolately sitting on the edge of a completely ice-bound pond.

As regards their habits generally, I cannot do better than follow Hume and quote what Macgillivray says:—

"Marshy places, the margins of lakes, pools and rivers, as well as brooks, rills and ditches, are its principal places of resort at all seasons. It walks with ease, even runs with considerable speed, swims and on occasion dives, although not in search of food. Seeds of *Gramineæ* and other plants, fleshy and fibrous roots, worms, mollusca, insects, small reptiles and fishes, are the principal objects of its search. In shallow water it reaches the bottom with its bill, keeping the hind part of the body erect by a continual motion of the feet. On the water it sits rather lightly, with the tail considerably inclined upwards; when searching under the surface it keeps the tail flat on the water; and when paddling at the bottom with its hind part up it directs the tail backwards. The male emits a low and rather soft cry between a croak and a murmur, and the female a louder and clearer jabber.

Both on being alarmed, and especially in flying off, quack ; but the quack of the female is much louder. When feeding they are silent, but when satiated they often amuse themselves with various jabberings, swim about, approach each other, move their heads backward and forward, 'duck' in the water, throwing it up over their backs, shoot along its surface, half flying half running, and in short are quite playful when in good humour. On being surprised or alarmed when on shore or on water, they spring up at once with a bound, rise obliquely to a considerable height and fly off with speed, their hard-quilled wings whistling against the air. When in full flight their velocity is very great, being probably a hundred miles in an hour. Like other ducks they impel themselves by quickly repeated flaps without sailings or undulations."

Probably some of us will not agree with what Hume says regarding the comparative merits of a punt gun and a shoulder gun when he declares that "There is more skill, knowledge, and endurance brought into play, and therefore more sport, in one day's big shooting than in a week of even such shooting as Captain Butler describes." I have had a little experience of both, and must most emphatically dissent. Of course a punt gun, especially one of the latest swivel-action, breech loading, non-recoil guns, will enable a sportsman to bring birds to bag that he could not otherwise get ; but it is not that he uses more skill in approaching, but that there is not the need to get so close. He does not require a more careful aim, for he takes his shot into the brown nearly always as they lie on the water. Nor does he require more endurance. To this most people will agree who have stood behind some 200 shots fired from a 12-bore carrying 3¼ drs. of powder. Certainly getting some one to push you along on a punt cannot be said to require more work than does the tramping after your birds on foot.

Mallard especially are strong fliers, and I would personally always feel more satisfaction on hearing the thud thud of a brace of birds on the ground in answer to the two barrels of my 12-bore than I should in seeing five, or even ten times that number, left on the water as the result of a lucky shot from a punt gun.

In shooting wild duck as they rise before one, it is as well to loose off one's piece as soon as possible, for, as Macgillivray says, they rise straight up in the air, whether flushed from land or water, and, whilst thus rising, offer what is perhaps the easiest shot, and at the same time they are not increasing their distance.

Mallard have queer fancies, and often resort to places where one could least expect them. I well remember a drake which used to come, year after year, to a tiny pond on a large private garden ; there were few or no weeds on the water, but it was entirely enclosed by trees and in very deep shade. As soon as the breeding season was on he used to go off, presumably to carry on his natural duties as a husband and a father ; but he never brought back with him either wife or family. There were sometimes tame duck about the place ; but he never seemed to care to associate with them, and kept them always at a respectable distance. What rendered it more curious that he should have chosen such a place was the fact that the garden was in the county of Norfolk, and was surrounded by the famous broads and fens where he might have obtained the society of any number of his own kind.

Yet another pair used to resort every winter to a small pond joined to a moat which ran round an old monastery. These were never seen on the moat itself, nor on any of the numerous ponds close to it, but when disturbed—they seldom were—used to fly straight away, not to return for some days or so.

In Indian limits the Mallard breeds in vast numbers on the Kashmir lakes and in smaller numbers on those in Tibet, probably also throughout the Himalayas in suitable places. Hume suggests that it may also be found to breed on swamps about the foot of these mountains ; but I can find no record of their ever having done so.

As far as we know, Kashmir is the breeding place *par excellence* of our Indian Mallards : here they are found in such great numbers that their eggs form a veritable article of commerce, boatloads at a time being collected on the shores of those lakes which they principally affect for breeding purposes.

The nest is a massive affair, composed of all and any materials, but principally of grasses, rushes, reeds, and similar articles.

The lining of down and feathers varies much. I have seen a nest into which one could plunge a hand to the wrist into down and feathers ; and again I have seen others which had not a handful of these in the whole nest. The normal position of the nest is on the ground in thick cover ; often it is placed in amongst the dense sedges, reeds, and bushes growing at the edge of the water; but at other times it is placed at some distance from the water; and at others again absolutely in the water itself, amongst some thick cluster of reeds or other aquatic plants.

The nest is not always however placed on the ground. Here in India the natives say that they sometimes find the eggs in nests on trees; but there seems to be no authentic record of one ever having been so found. In England two such nests have come within my personal experience. One of these was a huge construction of grass and reeds placed in the head of a polled willow. There was a deep indentation where the nest was placed, and the masses of twigs, then in thick foliage, quite concealed the nest from any one on the ground. The duck was however seen going in and the nest spotted. It contained eight eggs, which were, I believe, all hatched and the ducklings reared in safety.

The second nest was quite different. A huge tree (I forget now what it was), which divided in three quite close to the ground, threw out great horizontal limbs over a piece of water which lay still and dark and very deep beneath its shade and that of many other trees equally big and densely foliaged. At the end of one of these boughs, and in a most perilous position, on a few small twigs and branches, was the deserted nest of a magpie. It was knocked out of all shape, but still formed a strong platform of sticks and twigs, on which the duck placed a little down and a few feathers and laid her eggs. My brothers and I were small boys at the time, and of course, with the usual curiosity of small boys, paid constant visits to the nest, not in the least resented, as far as we could tell, by the duck, which never quitted it, or showed any signs of fear at our presence. The drake was far wilder, and seldom let us get a view of him. As a rule he was swimming quietly about in the pond below whilst his mate was employed in incubation; but more than once we frightened him from the tree itself, where he must have been perched on one of the big boughs.

The duck, we noticed, always got on one of the big boughs, and then fluttered and scrambled awkwardly into the nest. We got one egg out of the water, into which she must have knocked it; but she hatched some of the eggs, and we once or twice got a glimpse of the ducklings on the water.

Another curious nest I took was in Warwickshire, and was originally that of a coot, of whose eggs two still remained in the nest. It was placed in amongst the roots of a large tree standing at the edge of a large piece of water and partly in it. It consisted of a huge mass of weeds and grass, and was quite invisible from anywhere. The previous year the coot had been seen swimming to it, and the year the duck took possession must have again laid her eggs or two of them and then been driven away by the Mallards: these latter had eight eggs, hard set, but not so much so as the two coots, which were on the point of hatching: these latter were under the duck eggs, and had evidently been laid first.

There are many other instances of Mallards taking other birds' nests, amongst them one where they seized on the lofty abode of a rook.

In Kashmir it is said to breed sometimes in the rice-fields.

On leaving the nest the duck is said frequently to cover her eggs with weeds and grasses to screen them from observation. This is however, I think, the exception and *not* the rule. I have seen eggs so covered, but far more often I have found them without any additional cover at all. If hurried, the bird has not time of course to collect the necessary material; but even when leaving the nest deliberately and not disturbed in any way, I think she *generally* leaves her eggs as they lie.

They lay from six to twelve eggs; the natives say sixteen. I have never seen more than eleven; and Hume, who through his collectors must have had records of many hundreds of nests, never knew of more than eleven, so that anything above this number would appear to be abnormal.

In colour the eggs when first laid are of various tints, ranging from a very pale greyish-green to olive-grey and *café-au-lait*. As incubation proceeds the colour continues to deepen, and the green tinge, which is the most prevalent colour in the fresh egg, is nearly always lost. I had one egg in my collection which was a deep buff colour; it was found in East Prussia, and I cannot say how far advanced incubation was when the egg was taken; but, judging from the size of the hole, the chick could not have been very large.

The texture is very fine, smooth, close and satiny to the touch, like most ducks' eggs. There is a faint gloss, sometimes rather pronounced, in the fresh egg, often absent in those near hatching.

They are normally shaped ducks' eggs, *i.e.*, rather broad regular ovals, sometimes slightly compressed towards the smaller end, sometimes nearly equal at both ends.

My eggs and those I have records of, all come within Hume's measurements, in length varying between 2·1″ and 2·38″ and in breadth between 1·5″ and 1·72″.

20. ANAS PŒCILORHYNCHA.

The Spot-bill or Grey Duck.

Anas pœcilorhyncha, Jerdon, "Birds of India," III, p. 799 ; Hume, "Str. Feath." I, p. 261 ; Adam, *ibid*, p. 402 ; Hume and Davis, *ibid*, IV, p. 489 ; Hume, *ibid*, VII, p. 507 ; *id.*, *ibid*, VIII, p. 115 ; *id.*, Cat. No. 959; Hume and Marshall, "Game Birds of India," III, p. 168 ; Legge, "Birds of Ceylon," p. 1073; Oates, "Birds of British Burmah," II, p. 283 ; Barnes, "Birds of Bombay," p. 403; Hume, "Nests and Eggs" (Oates' ed.), III, p. 289 ; Salvadori, Cat. "Birds of British Museum," XXVII, p. 209 ; Blanford, "Birds of India," IV, p. 436.

Description : *Adult Male.*—Crown from forehead to nape dark brown, a streak of the same colour covering the lores and running through the eye to the back of the ear; coverts the same colour ; remainder of head and neck buffy-white or white, more or less centered dusky, with the exception of the chin and throat ; upper parts brown to brownish-black ; the scapulars paler and edged with pale brown, as are some of the feathers of the back ; rump and upper tail coverts deeper brown still ; tail the same but darker and more glossy, the feathers edged pale ; lesser and medium wing coverts grey, the greater ones dark grey, sub-tipped with white and tipped black ; speculum glossy green, bordered on either side with black ; secondaries tipped white, and inner secondaries with the outer webs more or less broadly white, remainder of wings brown ; upper breast fulvous-white, the feathers spotted with brown ; abdomen yet darker and browner, and the under tail coverts almost black.

"Speculum...........a rich emerald-green in most lights, a lovely rich blue or purple in others" (Hume). The amount of white on the inner secondaries varies a good deal and the depth of coloration on the lower surface, which is sometimes nearly white on the breast. The spots seem to increase in size with age.

Legs and feet deep coral-red ; claws black ; irides light to dark brown ; bill black, terminal one-third or less of the bill varying from yellow to reddish-yellow or orange; a spot at the base of the bill on either side next the forehead orange-red to deep coral-red; lower mandible black piped, the same as the maxilla.

Length "23·8″ to 25·9″; wing 10·6″ to 11·2″; tail from vent 4·7″ to 5·8″; tarsus 1·84″ to 1·93″; bill from gape 2·4″ to 2·75″; weight 2 lbs. 4 oz. to 3 lbs. 5 oz." (Hume).

Female Adult.—Similar to the male, but smaller and perhaps rather paler in coloration.

Legs and feet duller red than in the male, as also are the spots on the bill.

"Wing about 10 inches" (Salvadori).

"Length 22·0″ to 24·0″; wing 1·9″ to 10·7″; tail from vent 4·9″ to 5·3″; tarsus 1·7″ to 1·9″; bill from gape 2·3″ to 2·5″; weight 1 lb. 14 oz. to 2 lbs. 12 oz." (Hume).

Young resemble the adults, but have no red spots at the base of the bill, and have the feet coloured orange to brick-red. The general plumage is lighter, the spots fewer in number and less in size, the breast being unspotted white.

There appears to be no post-nuptial change in the plumage of the drake of this species, and inquiries made on this subject elicit no evidence to show that there is such a change.

Blanford (*in loco cit.*) shows that the male has 20 rectrices, whereas the female has but eighteen. This is very remarkable, and it is to be hoped that other observers will note the number of rectrices in both male and female, and so ascertain whether the difference is constant.

The closely allied *A. zonorhyncha*, which is found from China to Japan, may be recognized by the wing, which has far less white on the inner secondaries and no white sub-tips to the greater coverts; the speculum also is more blue than green.

Collectors in N.-E. Burma should be on the look out for this bird.

The Spotted-billed Duck is found practically throughout the Indian Empire on the mainland, but is absent from Southern Burma. It does not seem to have been recorded from the South Konkan; but as it occurs in Ceylon, it would naturally be almost sure to appear more or less frequently in the South Konkan also. I have a record of this duck from Tennasserim, but I am not sure that the identification was correct, and confirmation of its occurrence there is still required. Outside India it has been found in the Shan States, and might possibly, not probably, straggle into China. In the Cromwell Road Museum there is a specimen said to have been collected by Mr. J. R. Reeves in China ; but I see Salvadori considers the locality as doubtful.

Like all our local ducks, though not strictly migratory in the true sense of the word, yet they wander about a good deal under the influence of the weather and the want or otherwise of water. Thus in the drier portions of its habitat it is only a rainy-weather visitant, appearing only when the jheels and ponds contain sufficient water to satisfy its wants. In certain parts also, quite independently of the water-supply, this duck is much more common than in others ; thus all round the 24-Parganas, Nadia, Khulna, Jessore, and the Sunderbunds generally it is decidedly rare, but gets more common as one works further north or west. It is even more rare in the extreme north and north-east, but common all over Central India, getting more rare again towards the south.

In Ceylon itself it does not seem at all rare, for though Legge never met with it, he writes of others having done so not infrequently. He seems, however, to believe it to be only a winter visitant, but it will very likely be found eventually to be a resident.

In Manipur it is very common. Surgeon-Captain Woods says (*in epistola*): "This (the Spotted-billed Duck) is a very common duck in Manipur, though in the rains and in the nesting season, owing to the dense grassy jheels to which it resorts, it is seldom seen."

Hume seems to think that it never ascends the hills to any height ; but it is found in Manipur up to 3,000 feet. Mr. Woods records it from the Tankul hills at heights over 3,000 feet. I have seen stragglers here in valleys up to about the same height ; and it has been recorded from the Darjeeling Terai up to about 4,000 feet.

The Spotted-billed Duck is not a sociable bird, either with its own kind or with other species of duck ; often it is found singly or in pairs, and the flocks seldom number much over a dozen, though in rare instances they run up to as much as forty. Indeed Major MacMroy, as quoted by Hume, had frequently observed flocks of at least a hundred, and these he had seen both on the wing and at rest.

If they ever have to associate with other ducks, Hume says that they give the preference to teal or Shovellers ; and Woods writes to me : " I have often seen an old solitary Spotted-bill piloting a flock of teal across a jheel and jungle." In such cases the Spotted-bill may have had the company of the teal thrust upon him whether he desired it or not.

Their haunts seem to vary much ; but probably they prefer tanks, jheels and small pieces of water which are well covered with weeds ; they seldom resort to large, open pieces of water. Thus in Manipur I am told that the Spotted-bills do not as a rule frequent any of the larger, clearer sheets of water ; and that on the Logtak it is quite a rare duck when compared with the others which are found on that lake. They inhabit the smaller jheels, which are surrounded near the margin by jungle, and here they may be seen all asleep, except one or two which are on sentry duty near the edge.

They are also found, though I think but rarely, on small quickly-flowing streams in forest. On the other hand, on some of the bigger rivers they are not uncommon. Hume has "shot them several times both on the Ganges and Jumna (on both of which however they are rare), while on the Jhelum, Chenab, and Indus they are quite common."

Woods has "shot numbers of them on the banks of the Irrawaddy close to Sagaing." They are found, though not frequently, on the Brahmaputra, but they have been reported to me as being common on that river on the part which runs through Sadiya. I have no record of their occurrence on the Megna, Sunma, Barak, or any other of this network of rivers, though it is probable in the extreme that they may be met with here and there on any of them. It appears to be entirely a fresh-water duck, and this would be sufficient to account for its comparative absence from the Sunderbunds and their tidal and brackish waters. Whether it occurs on the Chulka lake, also of brackish water, I cannot say.

The Spotted-bill is, in every sense of the word, one of the finest and most game of our ducks. Even larger on an average than the Mallard, it fully rivals that bird for the table, and is, I think, more uniform in its good condition ; this no doubt is due to the fact that it has not to overtax its strength in long migrations.

It is a strong flier, though less quick in rising and not so speedy in getting under way as is the Mallard. When it just rises Hume compares it to an old hen, such a noise and flurry does it make, but the pace it puts on, once it is fairly started, compensates for its slowness at first. It is perhaps an easier bird than most of its size and weight to bring down when hit owing to its plumage being rather less dense than that of many other ducks. Even when brought down, however, it is not necessarily brought to bag at once, as it is a most expert diver and is one of the ducks which dive and grasp the weeds under the water, and so keep hidden below the surface: more often though they rise, but only high enough to allow of the tip of the bill protruding. Hume, Butler, and others have recovered birds quite dead, drowned through holding on to the weeds a little too long below the water. If winged so as to render diving either painful or impossible (a twisted wing prevents most ducks from diving), it will make for the nearest cover; and Woods informs me that he has found that the majority of those he has wounded without killing outright have taken this means of trying to avoid capture; at the same time he adds that they both dive and swim well.

Most writers agree that the voice of the Spotted-bill and of the Mallard are very much alike; but Hume considers that the quack of the former is the more sonorous. I cannot say that I have noticed any difference between the two.

They are not shy birds, and can generally be approached near enough for a shot fairly easily.

They are principally vegetable feeders, and do a good deal of damage to rice, both when young and when in the ear, trampling down a great deal more than they eat; they also at times eat all sorts of miscellaneous food, such as water mollusca, frogs, worms, insects, etc. Woods observes that the places where they feed can generally be detected at a glance from the state of the much-trampled blades of rice and the numerous feathers lying about. He says that he has had good sport by concealing himself in such places on bright moonlight nights and shooting the birds as they fly over. He has also been successful in getting capital sport with them over a decoy. The Mussalman Manipuris catch numbers of the flappers with spears and nets; and they sometimes form part of the bag when the natives in other parts of India have a duck drive into nets.

In Southern India (Mysore ?) Mr. Theobald says that the shikaris get within easy shot of these ducks by making bundles of rushes and weeds and pushing these along the surface of the water in front of them, the bundles affording a floating rest for their guns and also concealing the approach of the shooter.

Hume says : "The breeding season varies a great deal with locality. In the North-West Provinces, Oudh, and the eastern portions of Rajputana and the Punjab, it only breeds, so far as I yet know, once a year, laying during the latter half of July, August, and the first half of September. In Sind it lays in April and May and again in September and October. In Guzerat it certainly lays in October, and in Mysore in November and December, though whether in these two last-named provinces also it has a second spring brood I have not yet ascertained."

In Bengal, I think, it lays principally in July and August ; but a few birds are earlier, and these may have a second brood, for nests have been taken as late as October.

As a rule the nest is rather a compact, well-made structure, of a broad rather irregular cup-shape, made principally of grasses, rushes and weeds, and lined in almost all cases with down taken from the breasts of the ducks themselves. Sometimes there is no down at all, as in the nests taken by Captain Butler at Langraij between Deesa and Ahmedabad.

Captain G. F. L. Marshall gives the dimensions of a nest taken by him as follows: "About 9 inches across, 3 inches deep, and the sides fully 2 inches thick." This is perhaps a trifle smaller than the average nest, as the size depends so much on the compactness with which it is built.

Surgeon-Captain Woods sends me very interesting notes on the breeding of this duck. He writes : "Here the birds generally pair about the beginning of April ; but I have found a nest in a flooded *dhân khet* as late as October. The nests are composed of grass and feathers, the latter of which the parent birds pluck from their own breasts.

"I have found as many as 14 eggs in a nest, though the usual number is 10. The parent bird sits very close when incubating, and when alarmed feigns injury to a wing, as do others of the family.

"Towards the end of the rains both old and young birds frequent more open water and the flooded rice-fields. A place called the Kurram path, about 18 miles from Imphal, is a favourite breeding-ground, and towards the end of the rains the ducks may there be seen in hundreds with flappers in every stage of development."

In another letter he remarks on the curious fact that though the normal number of eggs laid is about 10, yet one never sees a family party containing more than six or seven young ones, so that the percentage of addled eggs or of accidents to the young after birth must be very great.

Mr. Doig found on one occasion that otters had been responsible for the destruction of a nest of eggs. He found a nest at Narra in Sind on the 1st of May which had contained 10 incubated eggs, but these, with the exception of one, were all scattered about and broken. Before reaching the island on which the nest was placed he had noticed a family of otters playing about, which all bolted at his approach, and which were doubtless the culprits concerned in the pillage of the nest.

The greater number of nests are placed on the ground, well concealed in rushes and grass, often at the edge of some piece of water or stream, frequently on islands, and not seldom in patches of grass well away from water. The ridges between rice-fields seem to be favourite places for them to make their nests upon, the proximity of the food-supply doubtless being an incentive to the birds to make use of such spots.

Hume thus describes the first nest taken by him. It "was placed on a drooping branch of a tree which hung down from the canal bank into a thick clump of rushes growing in a jheel that, near the bridge, fringes the canal. The nest was about 9 inches above the surface of the water, was entirely concealed in the rushes, and was firmly based on a horizontal bifurcation of the bough. It was composed of dry rush, had a good deep hollow, in which down, feathers, and fine grass were intermingled. The nest was at least a foot in diameter, perhaps more, and I suppose 2 inches thick in the centre and 4 inches at the sides. It contained three fresh eggs."

The number of eggs laid seems to vary considerably; but from about 8 to 10 may be taken as the normal number laid, often less, but not often more, though they may occasionally number as many as 14.

They are much like the eggs of the Mallard in appearance, though rather broader on an average as well as a little shorter. Hume's dimensions for the eggs of this duck are, length from 2·08″ to 2·3″, breadth 1·65″ to 1·18″, and the average of fifteen 2·15″ × 1·70″.

The eggs in my collection are of two rather distinct types, the one a broad regular oval, the other a narrower egg with one end very much smaller than the other and distinctly pointed. The texture is the same in both kinds and the colour also, generally a pale buff drab, much stained as incubation progresses. The two types average respectively 2·05″ × 1·62″ and 2·18″ × 1·60″.

They do fairly well in captivity, but are difficult to tame, and generally clear off as soon as they can fly. They have been known to breed in confinement; those in the Calcutta Zoological Gardens did so in 1885. They will also interbreed with the domestic duck; and there is a specimen in the British Museum collection of a hybrid between *A. pœcilorhyncha* and *A. boscas.*

The birds are very good parents, the duck sits close, and both she and the drake show the greatest consternation when their nests are discovered. Sometimes the disturber of their peace is tempted away from the vicinity of the nest by the duck pretending to be wounded, and fluttering about a short distance ahead, leading him to believe capture to be an easy matter until the capture is really attempted. Sometimes the birds wheel round and round in the air just above the nest, and refuse to leave even after its contents have been rifled. They also show great affection to one another, and one of a pair killed, the remaining one has been known to refuse to leave the spot until he or she, as the case may be, has fallen a victim to its constancy.

Genus EUNETTA.

The genus *Eunetta* may be at once distinguished from *Anas* by the sickle-shaped inner secondaries in the male, and by the remarkable length of both upper and lower tail coverts, which extend beyond the rectrices.

From *Chaulilasmus*, *Eunetta* may be distinguished by the number of rectrices, which is 16 in the former and only 14 in the latter. The females however of *C. streperus* and *E. falcata* are so much alike that these differences are given in full below. There is only one species in this genus, *E. falcata,* which occurs throughout Eastern Asia.

21. Eunetta falcata.

The Bronze-capped Teal.

Anas falcata, McLeod, "Str. Feath." X, p. 168.

Querquedula falcata, Hume, "Str. Feath.," IV, p. 225; *id.*, *ibid*, VII, p. 494 ; *ibid*, VIII, p. 115 ; *id.*, Cat. No. 966, bis ; Hume and Marshall, "Game Birds of India," III, p. 231 ; Reid, "Str. Feath.," X, p. 84.

Eunetta falcata, Salvadori, Cat. "Birds of British Museum," XXVII, p. 218 ; Blanford, "Birds of India," IV, p. 438.

Description : Adult Male.—"Crown deep chestnut ; sides of the head bronze-purple, greener posteriorly ; a long green mane on the back of the nape ; throat and upper part of the nape white, intersected below by a green collar ; mantle and upper scapulars with narrow crescentic bands grey and blackish ; rump blackish ; basal upper tail coverts grey, vermiculated with black, the longer ones black and entirely hiding the tail ; upper breast waved with alternate crescentic bars of black and white, producing a regular scaly appearance ; lower breast whitish, each feather with black bars, one of which is sub-terminal ; sides, flanks, and abdomen waved with narrow black and greyish bands; under tail coverts black, very long and reaching beyond the tail ; on each side of the tail coverts a distinct buff patch, the bases of the feathers being black, showing a beautiful black bar, which separates the buffy patch from another silky-white band formed by the tips of the lowest flank feathers ; scapulars grey, narrowly edged with black, and more or less distinctly whitish on the edges ; a black patch on the outer scapulars ; wing coverts grey, the last row whitish ; wing speculum on the secondaries dark glossy green, banded below by a narrow whitish band at the tip of the secondaries ; tertials very long and narrow, sickle-shaped, with the shafts whitish ; the webs velvety glossy black, the edges and part of the inner webs grey ; quills dark grey, almost blackish towards the tip ; under wing coverts white, but the greater ones grey ; axillaries white ; tail feathers grey, with narrow white edges ; bill greenish-black ; feet dull blue-grey, darker on the web ; iris brown. Total length 19″ ; wing 10″ ; tail 3″ ; culmen 1·8″ ; tarsus 1·35″ " (Salvadori).

"Irides deep brown ; bill perfectly black ; legs and feet drab with an olive tinge ; the webs, except immediately alongside the toes (where they are unicolorous with these), and claws dusky black.

"A frontal spot ending in a point on the culmen, about 0·4″ long and 0·3″ wide, pure white. Of another Indian-killed male the wing also measures 9·5″" (Hume and Marshall). "Bill from gape 2·1″" (Blanford).

Female.—"Head and neck brown, streaked with whitish, much paler beneath ; back and scapulars brown with concentric pale rufous bands; lower back and rump blackish ; upper tail coverts brown, with concentric pale bands; tail feathers brown; quills brown; speculum black, slightly glossed with green; wing coverts greyish-brown, with pale edges, especially the greater coverts; upper breast and sides dull rufous with concentric brown bars; abdomen whitish, with a few bars or spots; under tail coverts rufescent, with brown marks" (Blanford).

"Bill, feet, and irides as in the male" (Salvadori).

"Wings 9·85″ to 10·06″; tails 3·23″ to 3·57″; bill at front 1·75″ to 1·84″; tarsi 1·40″ to 1·62″" (Schrenk).

"Length 16·0″; wing 9·0″; tail 3·4″; tarsus 1·2″" (Dresser).

The strict habitat of this little duck is Eastern Asia, whence it ranges occasionally west, sometimes entering Eastern Europe. It breeds throughout Eastern Siberia, and lately I have received notes of its breeding from Manchuria. In the winter it descends south, and is common in China and Japan, and of very rare occurrence within our limits. Seebohm says ("Birds of the Japanese Empire"): "The Falcated Teal is a winter visitor to all the Japanese islands. The Perry Expedition found it to be one of the most abundant of the water-birds of Japan, and noticed it at various points during the voyage."

In India few specimens have been obtained since Hume's time, more probably owing to no notice being taken of them than for any other reason, although their occurrence is of course very rare. Hume notes five specimens which came into his possession: of these, two were caught by fowlers near Lucknow, and given to him by Dr. Bonavia; Major C. H. T. Marshall shot a male at Kurnal, 70 miles north of Delhi, in February; another was shot in the same month, about 30 miles from Delhi, by Mr. W. M. Chill; and the fifth was obtained by Hume himself in the Calcutta bazaar, and this he says was caught in the immediate vicinity.

Shortly after this General McLeod recorded that he had shot a female at Feroza, Bhawalpur, in December, 1879; and G. Reid in the same volume of "Stray Feathers" as that in which this record is made states: "Two years ago I myself saw two or three in the possession of a native fowler, who would not part with them except at a fancy price, saying he meant to take them with a lot of others he had to the ex-King of Oudh, who would pay him handsomely." He does not say whether the "lot of others" were of the same species, presumably not.

Another young male, without the sickle-shaped inner secondaries, was obtained by a friend in the Calcutta bazaar; a specimen has been shot in

Purneah; two specimens—an adult male and a young bird of the same sex—are in the Lucknow Museum, and were, I believe, obtained near that place. Besides these, one was lately obtained in Upper Burma, near Bhamo, and is the only one I can find recorded from Burma except Anderson's. Major Cowley, of the 43rd Gurkha Regiment, obtained one in Manipur, and, as far as I can ascertain, this is the only one ever seen in that State.

In addition to these, recorded above, the only other specimen I have ever heard of was one, a young male, shot by my father, E. B. Baker, in Jessore.

There is no reason however that sportsmen in Upper Burma should not meet with this bird more often than would seem to be the case, for N.-E. Burma is well within the range of its annual migrations, and doubtless when men wake up to the fact that records of rare ducks are still desirable, we shall have a good many from that quarter. Anderson obtained specimens on the Taipeng river in Upper Burma; but I cannot ascertain how many he got.

The Bronze-capped Teal, when found within our limits, appears always singly or in pairs, perhaps very rarely in small parties. In places where it is more numerous it collects in flocks, as a rule rather small, consisting of about twenty to thirty individuals, but at other times in very large flocks; and they are said to arrive at the borders of other breeding-grounds in immense flights.

It has the reputation of being a very sociable, if not highly gregarious, bird, and their small flocks frequently, indeed generally, seem to mix much with larger flocks of other species of teal and duck, with whom they feed and sleep in perfect harmony.

The flight is said to be swift and teal-like, and the bird to be very strong and active on the wing. I can find no record concerning these birds' swimming and diving powers, so that we may expect to find that these are neither abnormally developed nor yet much less in extent than they are in other teal.

Its cry when on the wing is noted as a "tolerably loud and piercing whistle" (Pejeralski); and it has also been heard to give vent to a chuckling quack as it swims about feeding.

Its diet seems to be principally, if not wholly, vegetarian, but very little has been written on this point.

The female Bronze-capped Teal is so like the female Gadwall that both Hume and Salvadori give the points by which they may be discriminated. They are these : The principal difference lies in the wing speculum ; in the Gadwall "the entire visible portions of the later secondaries are pure white, the terminal portions of their layer coverts white.

"In female *falcata* the visible portions of the later secondaries are black, with more or less of metallic-green reflections, narrowly tipped with white ; and the terminal portion of their greater coverts are black."

The maxilla also of the Gadwall is only dark along the culmen, whereas the whole of the upper mandible of the Bronze-cap is dark ; so also there is always more or less of an orange or yellowish tinge on the feet and legs of the Gadwall, whereas there is no trace of this colour in those of the other duck, in which they are more or less of a light slate colour. These last differences however will not be very noticeable in the dried skin, not at all in very old specimens, and can only be of use in discriminating birds in the flesh. It should be always borne in mind by anyone wishing to ascertain the identity of a bird that it is infinitely easier to do so whilst it is in the flesh than afterwards, when it has become a dried stiff specimen : the colours of the soft parts are then undiscernible, more often than not small marks of feathers, such as rings round the eyes, indistinct supercilia and similar markings are seldom as distinct as in the fresh bird, and often, if roughly handled in the skinning, become totally lost. Thus if it is possible the bird should be identified in the flesh as soon as possible and, if it cannot be, the colours of the soft parts must be carefully noted, and a rough note made also of anything remarkable in the coloration.

The Bronze-capped Teal breeds throughout Southern Siberia to the east and centre, but rarely to the west ; it has been found breeding on all four shores of Lake Baikal, but even there more plentifully to the east and south ; it breeds also in the Amur, and probably a good deal further north. Middendorf says that it "breeds plentifully in the Stanaway mountains, and nearly to the tops of the ranges," and, as Hume points out, if it selects sites at as high an altitude as this, it is sure to extend considerably further north in the plains.

In Manchuria, where my informant took several nests, they are said to make them on low-lying parts, along the banks of the larger rivers, which are more or less in the condition of swamps. The nest appears to be a rather well-built affair of rushes and reeds, rather more compactly put together than are most ducks' nests, and lined very plentifully with down, presumably taken from the breasts of the parent birds themselves. So thick is this down that in some of the nests, the cups of which were in some cases as much as six inches deep, it filled them completely to the top, hiding the eggs which were inside. The nests were placed in thick tufts of grass, beds of sedges, or, more rarely, under and amongst bushes; they were not very carefully hidden, and, but for the treacherous nature of the ground in which they were found, not particularly hard to get. The duck is a close sitter, and is assisted, at least occasionally, by the drake, which is seldom found far from the nest. They lay from six to nine eggs, beginning to lay in the end of May, and continuing through June and the early part of July.

The eggs are said to be like those of the Common Teal, but whiter and a great deal larger.

Dybrowski (*vide* Hume) says that in Western Dauria, and the country to the south of Lake Baikal, " the Crested Teal arrives in great numbers during the latter half of April; but in the Darasun region it is more common. The female makes her nest among the bushes of swamps, collecting dry reeds and grass, and lining it thickly with down. At the beginning of June she lays eight eggs, sits closely, and only rises at your feet. They remain in autumn as late as the 27th December.

Taczanowski in describing the eggs taken by the above naturalist writes: "The eggs are decidedly smaller than those of the Mallard, and in colour resemble those of the Gadwall, though the yellow tinge is somewhat more pronounced. They vary from 2·1″ at 2·3″ in length and from 1·52″ to nearly 1·7″ in breadth."

Dresser, quoted in Hume and Marshall, describes the eggs as being of a creamy-white colour, like the eggs of the Common Widgeon, and of a very smooth texture.

Genus CHAULELASMUS.

This genus is remarkably close to *Anas*, and might almost more conveniently come between *Anas* and *Eunetta* rather than between *Eunetta* and *Mareca* or *Nettion*. It differs from *Anas* in having the bill proportionately rather shorter and smaller, from *Eunetta* in not having the long inner secondaries sickle-shaped, and from *Mareca* and *Nettion* in having the lamellæ of the maxilla or upper mandible very prominent;

it is also of course, as far as the Indian species is concerned, a bigger bird than any of the two last-mentioned genera.

There are only two species of the present genus, our bird, the Gadwall, and *Chaulelasmus couesi*, a much smaller bird, confined to the Washington and New York Islands and the Fanning group, a bird of which very little is yet known.

22. CHAULELASMUS STREPERUS.

The Gadwall.

Chaulelasmus streperus.—Jerdon, "Birds of India," III, p. 802; Hume, "Str. Feath." VII, p. 115; *id.*, Cat., No. 961; Scully, "Str. Feath." VIII, p. 362; Hume and Marshall, "Game Birds," III, p. 181; Oates, "Birds of British Burmah," II, p. 283; Barnes, "Birds of Bombay," p. 405; Salvadori, "Birds of British Museum," XXVII, p. 221; Blanford, "Birds of India," IV, p. 440.

Description: Adult Male. - Head and neck whitish, rufous-white or dull rufous, densely speckled with brown, except on the chin, which is almost pure white in highly plumaged birds; the anterior portions of the head nearly always lighter than the posterior in ground-colour, which shades off into the brown of the nape, on which the darker spots hardly show; lower neck, back, and scapulars deep blackish-brown to dark rufous-brown, every feather beautifully waved with white crescentic lines; lower back darker, with fewer and finer vermiculations, sometimes almost unmarked, changing into the black of the rump and upper tail coverts; central rectrices grey, outer ones rufous-grey with almost white edges, generally increasing in width to the outermost ones; breast, sides of the body and flanks like the back, but the breast more *boldly* marked with the dark and light, and the vent portion flanks more *finely* so; rest of the abdomen, etc., white; under tail coverts typically the same velvety-black as the upper, but often splashed with patches of black and white vermiculations; the smallest wing coverts like the scapulars; the median and primary greater coverts chestnut, with the bases brown and white, sometimes showing; greater coverts next the secondaries black; secondaries pure grey, silvery towards the tips; a speculum formed by the outer secondaries, four or five glossy velvety black and three with broad pure white outer webs, the one next the black often with a narrow black edge; primaries brown-grey, darkest at the tips; shoulder of wing and under wing coverts white.

The colours, as with nearly all ducks, vary considerably; the abdomen is sometimes as pure white as freshly-fallen snow, often tinged with rufous and sometimes wholly of that colour. In the same way the colours of the head vary much also. I have a fine drake before me now in which the rufous head contrasts strongly with the blacker breast; and again another drake in which the two colours blend with one another.

Maxilla dark slaty brown, black or brown; mandible paler and yellowish or reddish on the gonys and tip; irides dark brown; legs yellow, brownish-yellow to dull orange; claws almost black.

"Legs and toes orange-red, less bright after the summer moult; claws black; webs dusky orange-red."

Length 19·5″ to 21·5″; wing 10·5″ to 11·75″; tail 3·4″ to 4·3″; tarsus about 1·5″; bill at front 1·90″ to 2·00″ and from gape 2·05″ to 2·25″; weight from 1 lb. 7 oz. to 2 lb. 4 oz.

Female.—General colour above brown, the feathers with buff or rufous margins, and the head and neck more or less spotted and streaked on a light ground; the scapulars unmarked dark brown; rump and upper tail coverts brownish-black; wings as in the male, but the chestnut, if not altogether absent, is present only on the outer webs of some of the median coverts; below the breasts and sides are pale rufous, sometimes rather darker, spotted with brown; under tail coverts and feathers about vent the same; remainder of lower parts white, more or less tinged with rufous.

Irides and legs the same as in the male; bill dull orange to yellowish-brown; the culmen and tip brown.

Length about 18″ to 20·1″; wing 9″ to 10″ (10·2″ Hume); tail 3·0″ to 4·0″ (3·7″ to 4·5″ Hume); tarsus 1·37″ to 1·42″; bill at front 1·8″ to 1·95″ and from gape 1·95″ to 2·15″; weight about 1 lb. to 1¾ lb.

"Young in first plumage closely resembles the adult female, but there is no chestnut or black on the wings; the white on the secondaries is dull; and the whole of the feathers on the under parts have obscure ill-defined brown centres." (Salvadori.)

Young in down are like those of the Mallard, "but there is a more pronounced golden tinge on the throat and cheeks, the streak through the eye is more defined, and there is a small dark spot at the junction of the mandibles which the Mallard has not." (Yarrell.)

After the breeding season the drake assumes a plumage similar to that of the duck, returning to his full dress attire before the winter has fairly set in, though a few males may still be found in the female garb as late as the middle of November.

Outside India the range of this fine duck may roughly be said to be the Northern Hemisphere. It breeds practically right across its habitat in the sub-Arctic region, and in the winter ranges down to Northern and Central Africa, and perhaps even further south, almost the whole of Southern Asia, and again as far south as Mexico and Jamaica in America.

Within India it is easier to say where it is not found rather than to enumerate all those places in which it does occur. Roughly speaking, it is found in vast numbers from the Himalayas, throughout Sind, North Bombay, the North-West Provinces, Punjab, and Bengal; from here it gets less common as it wanders south, until in Southern India, south of Mysore, and in Madras it is not found at all.

Throughout Assam, Manipur, Tipperah, and into Burma it abounds; and it is plentiful also in the Sunderbunds. Of course in some places it is more exceedingly abundant than in others. Thus in 1882-83 in Bengal we found that the Gadwalls numbered at least two to every one of all other kinds of ducks lumped together. Of a magnificent bag made by three guns in the Moolna bheel (Sunderbunds), out of 140 couple of duck and teal I think at least 40 couple, if not more, must have been Gadwall, and of the rest probably 70 or 80 couple were teal of sorts. Woods speaks of patches of water in Manipur "looking black with the number of Gadwall assembled on them." They begin to arrive there, according to him, about the 15th October, and though in Kashmir and along the Himalayas a few birds may arrive earlier, this will be found to be about the earliest date for Northern India.

In Mysore they do not arrive until the end of November as a rule, and at intervening places will be obtained on intervening dates. In Lower Bengal we never expected to see many before December; and I think they were most common in late December and early January. Hume says *re* the birds again leaving: "In the south they leave by the end of March or early in April. Farther north they are somewhat later (it depends a good deal on the season); and both in Sind and the Western and North-Western Punjab they are frequently shot in the first week of May." The dates are, I think, too late for Bengal and Assam, where there are few birds left after the first week or so in March.

When out snipe shooting in that month on extensive jheels and similar pieces of water, a few Gadwall may still be put up ; but nearly all that are seen will be hurriedly making their way north.

Surgeon-Captain Woods says that even in Manipur they leave about the end of March.

An interesting fact noted by this close observer is that many, perhaps the majority, of the ducks pair off before leaving their winter quarters. He says most of them pair in March, but that he has noticed some pairing as early as February. No one seems ever to have noticed these birds arriving at their breeding-grounds in pairs, so it is to be presumed that, their preliminary courtship completed, the pairs re-assemble in flocks which remain together until they reach their nesting haunts.

The Gadwall ranks very high up in the table of duck precedence. There are so many good points about it which attract favourable notice. As an article of diet few ducks are better. Some people would give the prize in this respect to the Mallard, others perhaps to the Pintail, but take the Gadwall all round it is hard to beat on the table. Personally I have never known the duck to have a fishy or other unpleasant flavour, nor have I met any Bengal sportsman who has charged it with this crime. But the northern presidencies have held men sometimes who have complained of this flavour when they first arrive. They *ought* to be all right, as they are almost entirely vegetable feeders, subsisting much on wild and cultivated rice, water weeds, etc., and seldom varying the diet with animal food. A drake shot in Silchar was found to contain a mass of small white worms in addition to some water berries and half ripe rice, but this in no way affected the flesh.

Before cooking however he has to be shot, and though not as a rule a very shy bird, yet he is quite wide awake enough to make the getting within shot of him an interesting, if not difficult, job. Where too he has been much shot at all, one's ingenuity and perseverance will be required before the game bag can be made to assume the bulgy appearance it ought. Then, when you have got within shot, the Gadwall proves a thoroughly sporting bird : he is quick off the water, rising rather straight up into the air, and getting very soon well under way, and in full flight the Gadwall is even faster than the Mallard and, as many writers have observed, reminds one much of teal in the manner of flying and the swish-swish of the wings as the flock hurtles overhead, leaving, let us hope, two birds in response to the right and left with which it has been greeted.

Shooting in the old days over the vast jheels in Khulna and Jessore, though teal might and generally *did* form the majority of the birds got, yet we always hoped that Gadwall *would*, and it was certainly these birds that gave us the most sport.

In some places the jheels themselves, vast stretches of water, shallow in the cold weather and much overgrown all round their borders with weeds, reeds and lilies, were surrounded with rice-fields, and through these wandered shallow waterways, some natural and others artificially made either for drainage or irrigation.

Daybreak would see us making our way from one of the main rivers up such a waterway, which we might have to traverse for some two or three miles before reaching the piece of water which formed our destination. Our boats were the light flat-bottomed *kundas*, or canoes, used so universally all over North-Eastern India ; and our seats were low *morahs*, or cane seats, which enabled us to swing round and get shots to our rear as well as in front and both sides, which a seat right across the boats would have prevented. We had not however to wait until we got to the jheel for our shooting, for snipe constantly got up to our right and left ; teal rose within shot in a manner far beyond what could be hoped for later on ; moreover the feeding flocks were scattered, and one bird down another shot might well be hoped for. Here and there too a Gadwall would find its way within range, these only getting up from patches of rice more than usually dense and thick. Less often a few Pintails would flash across us, but rarely within shot ; also Pochards, White-eyes, and Shovellers were all to be seen at intervals. Whilst it was still cool, and a few wisps of gently quivering mist were still lingering on the top of the water, loath yet to dissolve their ghostly lives into nothingness, we were generally well into the jheel and had scattered out into a long line. Snipe we now allowed to get up unheeded, though as yet there were but few, for not until the sun rose high and hot did they forsake the rice-fields and take to the deep water and the cool shade of the lily leaves. Whistling Teal swarmed in all directions, and kept circling round everywhere in countless myriads ; Purple Coots flustered and fluttered across the tops of the reeds and through the rushes ; the little Water-rail scurried across the surface of the water plants ;

and other undesirable birds, such as Water Hens, Jacanas, etc., were *en evidence* in every quarter ; still the continuous popping of the guns along the line showed that all the birds were not undesirable ones. Amongst the Whistlers overhead there would appear a flock of swifter, more quickly wheeling, birds, as the Blue-wing Teal came through them roused by one of the other boats, or a flock of Common Teal, flying in much the same manner, would rush down nearly the whole line, a splash or two in the water marking the members of their mess whom they had left behind. The duck however got up in front and went straight away, seldom wheeling within reach of even the outermost boats, though now and then a flock sweeping past high overhead would offer a difficult and often useless shot. The Gadwall, which were generally only in small flocks, were usually found where there was a certain amount of cover which, assimilating with the green screens on our boats, allowed us often to get within shot. They dive and swim very well when only wounded, and many a ten minutes was spent in retrieving such, for whose sake we generally kept a stock of No. 8 cartridges ready at hand to use instead of the No. 4 or 7 we used for the others. About 10 a.m. our boats all worked in towards some fixed point, and from about 11 a.m. to 1 p.m. was given up to lunch and smoke and an examination of the bag. Between 1 and 2 p.m. we would again embark, and the same routine was gone through, only reversed, and the shooting through the rice-fields was the *finalé*, not the commencement, of the afternoon's programme. It was seldom on such days that the three guns, who were generally out, could not get their fifty couple of game birds, by which I mean that Whistlers, Cotton Teal, and even snipe did not count towards the bag. As a rule the comparative number of snipe would be small, as they were not shot at except at the commencement and end of the day's shooting ; and we always considered the bag good or otherwise according to the number of Gadwall, Pintail, and other big duck contained in it.

I have no record now of what we got, but certainly we often got fifteen couple of Gadwall, and sometimes over thirty, whilst on one occasion, I think, the three of us got over forty couple.

The Gadwall did not seem to mind much what sort of water it was in ; early in the mornings and late in the evenings they were to be found in the rice-fields, generally, as I have already said, in some corner where the cover was denser than elsewhere : an hour after light they left the rice-fields, and were then found swimming about in semi-open pieces of water, but seldom in the large open expanses in the centre of the lake. It was very noticeable that in the rice-fields the birds were constantly seen either singly or in pairs, yet as soon as they left these they were very seldom found in pairs, and practically never alone but in flocks numbering ten to twenty, sometimes as many as forty. They seem to put on fat quicker than any other duck, or perhaps they feel the exertion of migration less. Of course the Mallard, which migrates often from parts very close to us, arrives fat ; but I have noticed early in the season, when other ducks are very poor, the Gadwall is in quite a plump condition.

The Gadwall has not yet been found to breed within our limits in spite of Hume's hopes to the contrary. That these are not groundless however is shown by the fact that a duck shot in Cachar contained eggs in the ovaries as large as a big marble ; and surely this bird could not have meant to have migrated far for the purpose of breeding ! This bird was shot in the end of April. Again a pair of birds were reported as having been shot in Kashmir in June (date ?), but the person who shot them, finding the ovaries "*very attenuated*," jumped to the conclusion that the birds could not have been breeding. Is it possible that the eggs had been laid ?

It has been noted as breeding in the British Isles, and also in Norway and Sweden ; indeed it has been found to nest as far north as Iceland, and there is a doubtful record of its having been found in Greenland. Its usual breeding habitat is however far more south ; throughout Southern Europe from Spain to Russia, not in Northern Africa as far as we yet know, in North-West Asia, in the sub-Arctic regions and in North America, where it has been found during the breeding season as far south as Texas.

Its nest is much like that of the Mallard or of the Spotted-billed Duck, but, unlike the former, I have never heard or read of its breeding in trees.

The nest is generally placed at the edge of the water in amongst dense sedge, reeds or bushes, and appears to be carefully concealed as a rule ; it is made of reeds, grass, or any similar material, or sometimes a few twigs, and is more or less lined with down from the birds themselves.

The eggs are said by various authors to number five to fourteen ; but probably six to eight or ten is the normal clutch.

The eggs vary much in colour, from an almost pure white to a greenish-drab. As with most eggs of ducks, as incubation advances the colours get duller and darker, and eggs which are white with a clean yellow or green tinge when laid become a dull grey or drab with the green tint dulled and sometimes quite lost. In texture and shape they do not vary from those of the Mallard, except in being slightly smaller.

Thirteen eggs of Hume are said to have averaged 2·62 × 1″·51″, but this is probably a mistake for 2·26″ × 1·51″.

The Gadwall seems to thrive well in confinement, and has often bred under these conditions, including several times in the Zoological Gardens.

(*To be continued.*)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, f.e.s.,

With Notes by H. J. Elwes, f.z.s., f.e.s., &c.,

and

Additions by Sir George F. Hampson, Bart., b.a., f.e.s., &c.

Part IV.

(*Continued from page* 634 *of Vol. XI.*)

Genus Notodonta, Ochsen.

289. *N. albifascia*, Moore.

Sikhim. I have only two specimens. (Taken by me at Darjeeling in July at light.—*H. J. E.*)

290. *N. gigantea*, Elwes.

Sikhim, 6,800 feet. I have one specimen. It has a wide range, apparently having been found in Kulu and also in the Khasia Hills. (The only specimen I ever saw from Sikhim was the type, a female, which I took at light on the 26th of August in Darjeeling. Since then I have received the undescribed male from the Khasia Hills. These specimens are smaller, 85 mm., in expanse, have the hindwing much paler, and the pectinations of the antennæ extending for two-thirds the length only.—*H. J. E.*)

291. *N. moorei*, Hmpsn.

Sikhim. This was taken by Mr. Knyvett in May according to Mr. Elwes. I have one specimen, taken in Darjeeling in July at light.

292. *N. sikhima*, Moore.

Sikhim, 10,000 to 12,000 feet. I have a specimen, taken at Lingtu by my collectors. The antenna of the male has the branches stiff, with fascicles of cilia at the end of each branch. This type of antenna is also found in *Fentonia apicalis*, Moore, *Antheua servula*, Drury, *Spatalia argentifera*, Wlk., and *Hyperæschra tenebrosa*, Moore (in the latter very slightly). It is very distinct from the ordinary pectinate form. Mr. Elwes has taken this species at light on Tongloo, 10,000 feet, in July.

Genus Hyperæschra, Butl.

294. *H. pallida*, Butl.

Sikhim. I have only one specimen, which is a female. The antennæ have the branches long.

296. *H. tenebrosa*, Moore.

Sikhim. I have obtained this through my collectors in September; I have only seen the male.

297. *H. basalis*, Moore.

Sikhim and Bhutan, 7,000 feet. This is not an uncommon species in July at light. (Occurs also in May at low elevations, I believe.—*H. J. E.*)

298. *H. nigribasis*, Hmpsn.

Sikhim. The only specimen I have obtained is now in the British Museum collection; the type is in Mr. Knyvett's collection.

300*a*. *H. trichostricha*, Hmpsn., Journ. Bo. N. H. Soc., Vol. XI, No. 2, p. 283. (Plate I, Figs. 16 and 16a.)

Sikhim, 1,800 feet. I obtained two specimens of this, one of which was taken in December; the type specimen was, I think, taken in October by me and is in the British Museum. It belongs to a separate section of the genus.

Sir George Hampson's sectional divisions on the form of the antennæ of the female should, I think, be again sub-divided thus—

Section I.—Female with antennæ pectinate (this sex only being available for study).

H. pallida, Butl.

Section II.—Female with antennæ ciliate.

(*a*) *Male with antennæ pectinate for two-thirds, terminal third serrate; branches thick and short with minute tufts of cilia at extremities.*

H. tenebrosa, Moore.

(*b*) *Male with antennæ bipectinate for two-thirds, terminal third serrate; branches slender without terminal tufts.*

H. basalis, Moore.

H. nigribasis, Hmpsn.

Section III.—Forewing much broader; antennæ of male bipectinate, with branches long and reaching almost to the tip.

H. trichostricha, Hmpsn.

Genus Lophopteryx, Steph.

301. *L. saturata*, Wlk.

Sikhim and Bhutan, 2,500 to 10,000 feet. The specimen which I took in September at 2,500 feet at Fagoo at light was probably a straggler, its proper range is from 4,000 feet upwards. It occurs in

August and September in Bhutan, and is not uncommon. Mr. Elwes has taken it at Darjeeling in July and August.

302. *L. atrofusa*, Hmpsn.

Sikhim and Bhutan. My only specimen was taken in Bhutan in June. Mr. Elwes remarks that it has been taken in September.

303. *L. flavistigma*, Moore.

Sikhim. I have two specimens which I originally placed under this name, but which I now believe are *L. crenulata*, Hmpsn., the outer margin of the forewings being deeply crenulated, especially below vein 4.

303*a*. *L. crenulata*, Hmpsn.

Yatong, Sikhim, and Bhutan. One of my specimens was taken in July near Gipmochi in Bhutan, and the other, I believe, at a much lower elevation in March. The Gipmochi specimen has the forewing uniform pale rufous, with a waved fuscous antemedial and two postmedial lines; the mark at the anal angle of the hindwing obscure: the other has the basal third of the forewing rufous, the medial third suffused with fuscous, and the outer third beyond the postmedial line variegated with ferruginous patches palest at the costa, a small whitish patch at the origin of the outer postmedial line on the inner margin; the hindwing with the mark at the anal angle prominent and whitish.

304. *L. ferruginosa*, Moore.

Sikhim. I have never seen a specimen.

Genus MEGACERAMIS, Hmpsn.

305. *M. lamprolepis*, Hmpsn.

Sikhim, 7,000 feet. I do not know this. (Two males of this small species taken by me at light in July in Darjeeling.—*H. J. E.*)

Genus SPATALIA, Hübn.

307. *S. argentifera*, Wlk.

Sikhim and Bhutan, 3,000 feet. Mr. Elwes remarks that this occurs in May and October at low elevations only. I do not think it goes lower than 3,000 feet, as I have never taken a specimen at my lights below this.

308. *S. gemmifera*, Moore.

Sikhim. I do not know this species. (Must be very rare, as I have only a single specimen from Mr. Knyvett.—*H. J. E.*)

309. *S. costalis*, Moore.

Sikhim and Bhutan, 1,800 and 3,000 feet. This and *S. albifasciata*, Hmpsn., I pointed out belonged to the second section of the genus, *viz.*, Male with branches of antennæ long; but, as Mr. Elwes was inclined to doubt the correctness of my identification, I sent a specimen of each of my species of *Spatalia* to Sir George Hampson, who agrees with me that my identification and division are correct, and says that females only were available when he had the species under examination. It occurs in May and July.

310. *S. argentata*, Moore.

Sikhim. I do not know this species. (Not uncommon in Darjeeling in July.—*H. J. E.*)

311. *S. albifasciata*, Hmpsn.

Sikhim and Bhutan, 1,800 and 3,000 feet. Two specimens only have been taken by me in September and October, both at light. It was originally described from the Nilgiris.

312. *S. auritractata*, Moore.

Sikhim, 1,800 feet. I have only one specimen, which I took at light in May. It is slightly greyer than *S. argentifera*, Wlk., and except for the form of the antennæ is otherwise indistinguishable. (I have never taken it myself, but it seems to be not uncommon at low elevations.—*H. J. E.*)

313. *S. plusioides*, Moore.

Sikhim and Bhutan, 2,500 to 3,000 feet. This is rather a variable species. I have a male from Sikhim with the triangular silver spot in the cell represented by a white outline only; two females from Sikhim and Bhutan have no marginal series of white specks, and the patagia are yellow.

The sectional division of the genus should stand as under:—

Section I.—Antennæ of male with the branches short, with a fascicle of cilia at the end of each branch.

S. argentifera, Wlk.
S. gemmifera, Moore.
S. argentata, Moore.

Section II.—Antennæ of males with branches long, with no fascicles of cilia at their ends.

S. costalis, Moore.
S. albifasciata, Hmpsn.
S. auritractata, Moore.
S. plusioides, Moore.

Genus BESAIA, Wlk.

314. *B. rubiginea*, Wlk.

Sikhim and Bhutan, 6,700 feet. The only specimen in my collection I took settled on some palings at Pasheteng in September. It is apparently rare.

Genus ICHTHYURA, Hübn.

316. *I. anachoreta*, Fabr.

Sikhim, 5,500 feet. I reared two males from pupæ taken at Tukvar. The cocoons were formed of the leaves of *Salix babylonica* drawn together, on which tree the larva probably feeds. The moths emerged in November. Mr. Elwes has specimens taken in February and May.

317*a*. *I. transecta*, n. sp. (PLATE I, FIG. 6.)

♂. Fuscous-brown; head and medial part of collar black. Forewing irrorated with fuscous; a pale oblique subbasal line bent outwards on median nervure; a pale oblique slightly sinuous antemedial line; a pale oblique line across the apical area angled below vein 4, then inwardly oblique and sinuous to inner margin; a dark brown patch on the apical area, leaving the costa and margin pale brown, and with an irregularly dentate edge, crossed by an obscure dark sinuous line in continuation of the sinuous part of the postmedial line, and a submarginal series of dark specks.

Sikhim, 1,800 feet (*Dudgeon*). *Exp.* 40 mm. Type in British Museum. Sir George Hampson has kindly allowed me to make use of this description.

319. *I. restitura*, Wlk.

Sikhim and Bhutan, 1,800 to 5,500 feet. I have taken the larva of this commonly feeding on the leaves of *Salix babylonica*, a non-indigenous tree. It occurs in the perfect stage in June, July, August and October. This species is variable, two males and two females have the medial outwardly-curved line replaced by an oblique line from the middle of the antemedial line to the postmedial line at the inner margin. This is possibly the form described by Mr. Moore as *I. ferruginea* from North-east Bengal.

Genus ACIDON, Hmpsn.

321*a*. ***A.** paradoxa*, Hmpsn.

Sikhim and Bhutan, 1,800 to 2,500 feet. I have taken four males only of this species at light in May and August. It does not look like any other species of the *Notodontidæ*; the length of the third joint of the palpus, the tufts on the proximal segments of the abdomen, and the abnormal neuration of the forewing make its position uncertain.

Genus CYPHANTA, Wlk.

322. *C. xanthochlora*, Wlk.

Sikhim, 9,000 feet. This, it would appear, is not uncommon at the elevation named, where Dr. Pilcher seems to have obtained several specimens. I have two males taken in July. Mr. Elwes remarks that it is probably a local insect, as his collectors never procured it.

Family CYMATOPHORIDÆ.

Genus HABROSYNE, Hübn.

324. *H. derasa*, Linn.

Sikhim, 5,500 feet; var. *fraterna*, (Moore), Yatung, 12,000 feet (*Taylor*). It is found in October, and does not seem to be common. I received one specimen of the variety *fraterna*, (Moore), from Yatung, which agrees exactly with Mr. Butler's figure.

325. *H. plagiosa*, Moore.

Sikhim. I have never received this species.

327. *H. argenteipuncta*, Hmpsn.

Sikhim and Bhutan. My only specimen was taken below Lingtu at 6,000 to 7,000 feet in August.

328. *H. sanguinea*, Moore.

Sikhim. I have not seen a specimen.

Genus THYATIRA, Hübn.

329. *T. batis*, Linn.

Sikhim, 5,000 feet. I have taken this species at 5,000 feet in October; Mr. Elwes took it at Darjeeling in May and July.

329*a*. *T. decorata*, Moore.

Sikhim. Sir George Hampson suggested that this was a distinct species, although he included it with *T. batis*, probably not having sufficient material to determine. Mr. Elwes has four specimens which do not show any variation, and he agrees that it is perfectly distinct from *T. batis*.

Genus GAURENA, Wlk.

330. *G. florens*, Wlk.

Sikhim and Bhutan, 3,000 to 7,000 feet. My specimens were obtained in August, September and October, but it probably occurs throughout the warmer months. Mr. Elwes remarks that it is one of the commonest moths in June and July in Darjeeling.

331. *G. aurofasciata*, Hmpsn.

Sikhim, 10,000 feet ; Yatung, 13,000 feet. The form from Yatung which I have called *fulgurita* differs from typical *G. aurofasciata* in being larger (44 mm.), the golden markings replaced by silvery-white ones, the subbasal band on the forewing narrower, the submarginal series of spots present though small, and the marginal series of lunules white and complete. Typical *G. aurofasciata* I have from Tongloo taken in August. (Taken on the Goompahar at light in July and August, but not in Darjeeling itself.—*H. J. E.*)

332. *G. florescens*, Wlk.

Sikhim and Bhutan, 5,500 to 8,000 feet. This is almost as common as *G. florens*, Wlk., and occurs with it. I have specimens taken in June, July and October.

332*a*. *G. tenuis*, Hmpsn.

Yatung, Sikhim, 13,000 feet. The type was obtained by Col. Bingham and is in the British Museum collection.

332*b*. *G. argentisparsa*, Dudgn. (PLATE 1, FIG. 19.)

Yatung ; Sikhim, 13,000 feet. Two specimens of this species were obtained by Mr. Taylor of the Chinese Commission, and were given to me by Mr. Lister of Darjeeling. They have the forewing silvery-grey irrorated with fuscous, the markings somewhat as in *G. florens*, but silvery-white, not in the least yellowish. The types are in the British Museum and my own collection.

334. *G. lichenea*, Hmpsn.

Sikhim, 4,500 feet. I received a very fine specimen of what I believe to be this species from Mr. Walter Weston, which he took below Kurseong in September. The medial area of the forewing is somewhat rufous as in *G. solena*, (Swinh.), but the hindwing is white with a broad fuscous marginal band. *Exp.* 42 mm. (Apparently a very rare species. A single specimen from Möller's collection is all I have seen from Sikhim.—*H. J. E.*)

Genus POLYPLOCA, Hübn.

334*b*. *P. bifasciata*, Hmpsn.

Sikhim. I have not seen a specimen. (Taken at Jorepokri by Knyvett in March.—*H. J. E.*)

335. *P. orbicularis*, Moore.

Sikhim. I have not received this. (Occurs in March at 7,000 to 8,000 feet.—*H. J. E.*)

338. *P. albidisca*, Warr.

Sikhim and Bhutan, 6,400 feet. I took a single specimen of this at Rissoom in October ; Mr. Elwes has three specimens without indication of date or elevation from Sikhim.

339. *P. cuprina*, Moore.

Sikhim and Bhutan, 6,400 feet. I have one male which I took at Rissoom in April. (Three specimens taken on August 26th at light in Darjeeling.—*H. J. E.*)

339*a*. *P. polychromata*, Hmpsn.

Sikhim. I do not know this species. (The type of this pretty species is the only one I have seen ; it was procured by one of Möller's collectors, probably in the interior.—*H. J. E.*)

339*b*. *P. renalis*, Moore.

Sikhim (*Hampson*). I do not know it.

Genus Palimpsestes, Hübn.

340. *P. albicosta*, Moore.

Sikhim and Bhutan, 6,400 feet. I took a single male of this in September at Rissoom, the costa of the forewing is white, suffused with greenish-yellow and pink. (Not uncommon at 7,000 to 8,000 feet in July and August.—*H. J. E.*)

341. *P. albibasis*, Hmpsn.

Sikhim (*Hampson*). Neither Mr. Elwes nor I have seen a specimen from Sikhim.

Genus Nemacerota, Hmpsn.

343. *N. alternata*, Moore.

Sikhim. I have not received it. (Rare at about 7,000 feet in May and June.—*H. J. E.*)

Genus Toxoides, Hmpsn.

344. *T. undulata*, Moore.

Sikhim, 7,000 feet. I have only seen one specimen of this species, which was taken by Dr. Pilcher at light in Darjeeling. (My only specimen was taken on the 25th June.—*H. J. E.*)

Family SESIIDÆ.

Genus Trilochana, Moore.

350. *T. scolioides*, Moore.

Sikhim. I have never seen a specimen. Sir George Hampson remarks that there is no locality on the type specimen in collection Atkinson, and it may not be from Sikhim.

Genus Sciapteron, Staudgr.

355. *S. atkinsoni*, Moore.

Sikhim. This has never been brought to me. (Taken by me near Darjeeling in July. A specimen from Möller's collection was procured in the Terai in June.—*H. J. E.*)

357. *S. sikkima*, Moore.

Sikhim. Neither Mr. Elwes or I have seen a specimen, the type of which is in Dr. Staudinger's collection.

Genus Sesia, Fabr.

372. *S. tricincta*, Moore.

Sikhim, 5,500 feet. I have one specimen which I took at Tukvar on the 21st August.

373. *S. flava*, Moore.

Sikhim and Bhutan, 2,500 feet. I have two specimens taken in May, they, however, do not correspond exactly with the description given. The antennæ are blue-black ; no yellow on vertex of thorax ; abdomen deep blue-black, with segmental yellow bands ; anal tuft yellow and blue-black ; frons pure white ; apex of the forewing broadly yellow, also the outer edge of the disco-cellular bar. *Exp.* 19 millim.

Genus Melittia, Wlk.

387. ***M.** eurytion*, Westw.

Sikhim and Bhutan, up to 4,000 feet. Common ; affects ordure and is often found on decaying animal matter. It occurs in July and August.

388. *M. indica*, Butl.

Sikhim. Common in May, June, July and August, found in similar places to the last.

389. *M. grandis*, Hmpsn.

Sikhim. This is apparently the largest of the Indian species. Possibly the specimen in my collection, identified as *M. gigantea*, Moore, by Mr. Moore, is the same. It, however, does not expand more than 44 millim.

and as the abdomen is wanting, there is no probability of rightly identifying it.

390. *M. newara*, Moore.

Sikhim and Bhutan, 2,500 feet. I have only one specimen of this taken in August. It has the curious habit, in common with other species of the genus, of rubbing its hindlegs together when on the wing.

493. *M. gigantea*, Moore.

Sikhim, 5,500 feet. One specimen which I took in September was identified by Mr. Moore as belonging to this species.

394. *M. chalciformis*, Fabr.

Sikhim and Bhutan, 1,800 to 3,000 feet. I have six specimens which apparently belong to this species taken in June, July and August.

395. *M. nepcha*, Moore.

Sikhim, 1,800 feet. I have two specimens taken at light in July and August at Punkabaree.

Key to the Sikhim species.

A.—Hindwing with patch of blue or greenish-blue scales at the inner margin.

(*a*). *Hindlegs black ; tibia with tufts of pale yellow hairs on the upper side and whitish marks beneath ; tarsus black with whitish marks beneath.*

M. indica, Butl.

(*b*). *Hindlegs black ; tibia with spare tufts of white hairs on the upperside, bluish-white tufts on the underside of tibia and tarsus.*

M. nepcha, Moore.

(*c*). *Hindlegs black ; hairs on the outside of the tibia and all those clothing the tarsus fiery orange.*

M. grandis, Hmpsn.

B.—Hindwing with patch of dull golden-yellow scales at the inner margin.

(*a*). *Hindlegs black ; tibia and upper joint of tarsus clothed with chocolate-brown hairs on the outside, with whitish hairs above and whitish marks below ; tarsus black.*

M. eurytion, Westw.

(*b*). *Hindlegs black ; tibia and tarsus tufted on the outside with yellow and fulvous hairs, bluish-white or yellowish marks beneath.*

a^1. *Of large size (44 millim.) ; the costa of forewing ochreous.*

M. gigantea, Moore.

b^1. *Of smaller size (32-36 millim.) ; the costa of the forewing dark.*

M. chalciformis, Fabr.

(*c*). *Hindlegs black ; tuft of pale yellow hairs on the upperside of tibia, with slight reddish tuft near joint of tarsus and tibia ; underside with bluish-white marks on tibia, and slight yellow tuft on tarsus.*

M. newara, Moore.

Genus Lenyra, Wlk.

396. *L. astaroth*, Westw.

Sikhim and Bhutan, 1,000 feet. I took a single male at the foot of the Daling hills in Bhutan in July, and I have a female from Sikhim without indication of elevation or date of capture. The antennæ of the female have the club much longer and more gradual than in the male. Its flight is much slower than *Melittia*, but it has the same habit of rubbing the hindlegs together when flying ; I do not know, however, that it affects ordure in the same way.

(*To be continued.*)

THE BIRDS OF NORTH KANARA.

By J. Davidson, i.c.s.

Part II.

(*Continued from page* 679, *Vol. XI.*)

1010. Thereiceryx viridis, Bodd.

This bird is very common everywhere in Kanara except the extreme north-east corner. It breeds everywhere from the end of February to the end of May, and is so common that one can find half a dozen nests in a morning.

1019. Xantholæma hæmacephala, P. L. S. Mull.

Common along the coast round the villages from Karwar to Bhutkul; also in the forests above Ghats east of Sirsi. Absent from the central belt of forest and the sides of the Ghats. It breeds in February, March, and the beginning of April.

1020. Xantholæma malabarica, Blyth.

This barbet takes the place of the preceding one in the central belt of country and also along the ridge of the Ghats. It also overlaps it a little to the east of Sirsi, and extends through all the heavy forests below Ghats. It is, however, never found in or among villages, except when in deep forest. I have taken nests with eggs in January, February and March, but have always found the nests difficult to find, and considering how common the bird is, the number of eggs I have taken is disappointing. The nests are in very similar situations, and the eggs similar to those of *X. hœmacephala*, though I think the shells are generally stronger.

1022. Coracias indica, Linn.

The Indian roller is very common in the cold weather, everywhere along the coast. It, however, leaves the coast completely about March. Above Ghats it is nowhere common, but a few breed in Supa, Sirsi, Yellapur and Halyal in March and April.

1024. Coracias garrula, Linn.

I shot a single specimen of this bird in November, 1893, at Majali, five miles north of Karwar. I have never seen the bird again.

1026. Merops viridis, Linn.

Very common in the cold weather, and till March below the Ghats. It probably breeds there in the end of March and April, but I have no record to that effect, and I have not noticed it in Karwar during the rains till the end of September. Above Ghats I have seen it at all seasons, and it breeds abundantly there in March and April.

1027. Merops philippinus, Linn.

This bee-eater appears in Karwar in the end of September, and is fairly common in particular places below Ghats till March. It is, howver, as far as I know, restricted to a few places; one near Gokern and another near Kutgul are almost certain to have a few about any time during the winter. Above Ghats I only saw the bird once or twice in March and April. They were merely passing and were gone by next day. I do not think the bird breeds anywhere in the district.

1030. Melittophagus swinhoii, Hume.

Generally distributed through the thicker forest portions of the district both above and below Ghats. Not, however, very common anywhere. It breeds singly in March and April in the banks of the various rivers and nullahs.

1031. Nyctiornis athertoni, Jard. & Selby.

This is a very shy bird, and were it not for its noisiness would be constantly passed over. I have seen it however along all the roads crossing the Ghats from Nilkund to Anshi as well as in many cases through the forests above Ghats in western and central Kanara. I have taken a good many nests. They are, as a rule, made in banks along the roads (though I have seen one or two in those above streams), and are often five or six feet deep. As soon as the bird begins to lay, the tunnel contains fragments of bees and beetles, and the eggs are laid among a quantity of these. The eggs are generally completely covered with *debris*, and I cannot understand how the young are not suffocated. I have taken eggs from the end of March to the middle of April, but the birds have commenced excavating their nests as early as January. I took two nests on the little road between Karwar and Godhalli on the 22nd March, 1896, just before leaving the district. The eggs, four and three in number, were fresh, and the two females allowed me to dig them out. The road coolies are very fond of these birds, and habitually dig out their nests and eat old and young. Cobras are also partial to them, and it is necessary to be cautious in putting your hand into these deep holes. I had a fright once, a snake (not a cobra) coming out when I had half dug into a hole.

1033. Ceryle varia, Strickl.

By no means common in Kanara. Occasionally noticed, however, along the rivers below Ghats from Ankola southwards; also in the extreme east of the district. I took a nest with five eggs near Honawar in January.

1035. Alcedo ispida, Linn.

Common throughout the district. It breeds abundantly about Karwar in July, and above Ghats in March and April.

1036. Alcedo beavini, Wald.

I have no right to include this species as I have never procured a specimen. I feel, however, certain I saw a single specimen near Nilkund in January, 1896. It flew out of a thick ferny bank above a small stream bordering a supari garden, surrounded on both sides by dense evergreen forest. It was quite close to me when it flew out, and as I had a gun in my hand I might have shot it flying, but I was very anxious to kill it, and did not like to risk a shot. It only flew sixty or seventy yards and lit on the bank among the thick ferns. It sat there till I was quite close and darted round a corner before I could cover it. Where it went I could not discover, and though I waited an hour or so it never came back. Its small size and bright pale colour were very striking, and I have no doubt as to its having been correctly identified.

1043. Pelargopsis gurial, Pears.

A fairly common bird everywhere in Kanara, except the extreme east. I have taken eggs near Sirsi in April.

1044. Halcyon smyrnensis, Linn.

Intensely common everywhere in Kanara. It is a grasshopper eater, and is often found breeding far away from any water. Half a dozen nests may be taken any day in March or April almost any place above Ghats.

1045. Halcyon pileata, Bodd.

This handsome kingfisher is rare in Kanara, and I cannot be quite sure whether it is or is not a permanent resident. The few specimens I have seen have all been single, but they have practically been at all seasons but the very hot weather. I have notes of the following :—

Chitakuli (three miles north of Karwar on the coast). Two specimens shot on different days and at different places in November, 1894.

Karwar.—A single specimen seen once or twice in August or September, 1889.

Amdalla (ten miles south of Karwar on the coast).—A single specimen on 20th February, 1894.

Near Kumta on the Tudri river.—A single specimen on 25th November, 1893.

Talan (five miles due east of Bhutkul).—A single specimen on 20th December, 1893.

At the Gairsoppa falls (at least 20 miles as the crow flies from the sea). A single specimen on the 30th December, 1893.

1051. Dichoceros bicornis, Linn.

Sparingly found through all the large forests immediately below the Ghats, and occasionally in the central forests above Ghats. The bird appears invariably to breed in the same nest; but though I have been told of others, I only know of one. This is about three miles from Kutkul in the Kumta taluka; I was first shown it on the 12th February, 1890. It was in a very tall branchless tree in evergreen jungle. A huge branch had been torn from the trunk about 40 or 50 feet from the ground and had formed a ragged cavity, and in this the birds, I was told, had bred for many years, and each year when the young one was half grown, the villagers dug it and the mother out and devoured them. To this circumstance they attributed the numerous tribe of children inhabiting the village. A small stump of a branch remained four or five feet below the hole, and after some three hours work by tying bamboo ladders one above the other, two villagers climbed up, and standing on the stump, after a considerable struggle stabbed the old hen on her nest, which contained one fresh egg, and which could not be obtained till after the old one had been killed. I visited the nest again on the 4th March, 1894, but it then contained a single small young one, and in the end of January, 1895, the birds had not laid.

1052. Anthracoceros coronatus, Bodd.

This hornbill is a good deal commoner than the last, and habitually at all seasons goes about in considerable flocks. It is most common in the deciduous forest in the east of Halyal, Yellapur, Mundgode and Sirsi; but I saw a pair at Bhutkul in January, 1889, and a flock of some twenty near Kutgul in January, 1894. I also saw others near

Arbail in February, 1893. The only egg I obtained was taken on the 9th March, 1893, a few miles east of Sirsi, and was brought to me with the old bird which had been caught on the nest.

1062. LOPHOCEROS BIROSTRIS, Scop.

This hornbill is found sparingly along the east of the district from Halyal to Bunwasi (east of Sirsi). It is not found, as far as I know, further than about twelve miles from the eastern frontier. It breeds in March and April, and I found several nests about Ekambe (east of Sirsi), and no doubt, had I taken any trouble, I could have found them in other places also.

1063. LOPHOCEROS GRISEUS, Lath.

This is the common Kanara hornbill, and it is common everywhere from the coast to within ten or twelve miles of the eastern border. It there meets *L. birostris*, and in some places both species occur. I have taken many nests with eggs from the end of February to the beginning of April ; they generally contained three eggs, but I have found four in a few cases.

1066. UPUPA EPOPS, Linn.

A cold weather visitor both above and below the Ghats ; noticed occasionally from November to March.

1067. UPUPA INDICA, Reich.

A permanent resident above the Ghats, but scarce except in the forests of Mundgode, Yellapur, and Halyal. I took a nest with five eggs much incubated in the Yellapur taluka on the 6th April, 1894, and I have seen other nests but in places it was troublesome to cut out.

1068. CYPSELUS MELBA, Linn.

A permanent resident. Enormous numbers breed in cracks in the cliffs near the top of the Gairsoppa waterfall. They breed in February and probably later, and no doubt the specimens seen at all seasons come there to roost, as in the evenings they pour in long after dark.

1072. CYPSELUS LEUCONYX, Blyth.

This is the common Kanara swift, and may be known on the wing from *C. affinis* by the tail being forked, making the bird look much larger.

It appears in large flocks occasionally at Karwar during the rains, and all along the coast it may be found in the cold weather for two or three evenings consecutively when it disappears for often lengthened periods. I have seen it in considerable numbers on the ridge of the

Ghats close to the Dudsagar station on the Portuguese railway at all seasons I have been there ; they seemed to fly in and out of some caves in the cliffs above the station-master's house. I have never been able to visit the place, and it is to be hoped someone at Castle Rock will manage to do so and see if there are nests. April, I should think, would be the most likely month.

1073. CYPSELUS AFFINIS, Gray & Hardw.

Noticed occasionally about Karwar in the rains, and common about Halyal. In the latter place large numbers breed under the bridges near Alnawar and in the veranda of the forest bungalow in Halyal.

1075. TACHORNIS BATASSIENSIS, Gray.

Found all over the district. Wherever a *Borassus* is found, there are sure to be a number of these swifts. They however, I am sure, sometimes breed on the supari palm, as I found them to do in Mysore, as the bird is constantly seen in places where no "tar" trees are found.

1078. CHÆTURA INDICA, Hume.

This fine spine-tail is, I believe, a permanent resident in Kanara, and I have numerous notes of having seen them from January to the end of May in many places above Ghats. During the rest of the year I have generally been on the coast or at all events below Ghats, and I cannot tell whether at that season they are also to be found above Ghats. I noticed a few flying round some castellated rocks near Ulvi in Supa in the middle of March, and the villagers declared they bred there in the rains. They are by far the fastest flying birds I have ever seen, and must fly about twice as fast as the Alpine swift ; indeed, sometimes a flock has passed over and is gone before one has made up his mind to risk a shot at them. I shot four with some twenty shots at Sirsi in April, 1894 ; all were males, and none showed any signs of breeding.

1079. CHÆTURA SYLVATICA, Tick.

This pretty little spine-tail is distinctly local, but a few may be found regularly in many places. They keep to the evergreen jungle and the neighbourhood of dead "baini" palms. I have little doubt they breed in holes in these, but I have never been able to prove it. At Manchikeri in the Yellapur taluka I came on a large flock flying out and into the trunk of a huge tree, which divided into three large stems, two of which were hollow throughout. After much labour I cut a hole large enough to put my head into, and could see everything between myself and the large hole they entered, but no trace of a nest of any description was visible. Some years afterwards I visited the tree again, but there were no swifts about it. Again in March, 1893, I saw a number flying round some dead palm trees near Sirsi, and striking one of the trees with a stick, I started a swift from the second hole in it, some thirty feet from the ground. This tree leant against a stout banyan which crossed it twenty feet up, and consequently a boy easily climbed up. He got to the hole immediately below the hole the swift came from and some four feet below it, but though a plucky youngster, he objected to go higher, saying the tree was quite rotten, and it shook and cracked so ominously, I did not like to press him further, and as I had some idea of propping up a ladder, I did not cut the tree down, a thing I now much regret, as I could not find time to come back, as I intended, in the afternoon. However in 1896 at Kukbarada in Supa I cut down a " baini " tree, round which two pairs habitually circled, but there was not a trace of nest or egg shells.

1081. COLLOCALIA FUCIPHAGA.

This swift breeds in considerable numbers on Nitrani (Pigeon Island), off the coast of Honawar in March and April, and I have had nests brought from there for me. I have seen large flocks at Murdeshwar and also at Gairsoppa in the cold weather.

1086. MACROPTERYX CORONATA, Tick.

Generally distributed in Kanara and really common in the opener jungle along the coast and in the east portion of the district. I have taken the nest with young as early as 29th January at Godhalli close to Karwar, but as a rule eggs are not found till well on in February, and may be got any time afterwards till near the end of April. So common is the bird in the hills east of Ankola, that having taken one or two eggs there in March, in an evil moment I promised one of the villagers a rupee for each egg he could find for me. He turned up at my camp fifty miles off in the end of April with a small basket, which, on examination, proved to contain 46 eggs of this species. As it only, of course, lays one egg and takes a long time to build, at the smallest computation this represented the nests of at least 23 pairs. The bird is common during the rains at Karwar.

1090. CAPRIMULGUS MONTICOLA, Frank.

This nightjar is fairly common above the Ghats from Halyal to Siddapur, and I have obtained specimens both at Ankola and Bhutkul It breeds in the end of March and beginning of April, and I have taken a good many nests in the neighbourhood of Sirsi. Its cry is a long wailing cry like an owl, and it appears at dusk and flying high, sails up and down over the forest, occasionally alighting high up on a tree.

1091. CAPRIMULGUS ASIATICUS, Lath.

This nightjar shuns the forest. It is common in the open country about Halyal and Mundgode, and also fairly abundant in the open parts along the coast. I have never seen it in the centre of the district. Its note is "tuk-tuk-tuk-tookuraluk." It breeds in March.

1093. CAPRIMULGUS MACRURUS, Horsf. form ATRIPENNIS, Jerd.

This is the small form of this bird, and the Kanara specimens do not vary from each other in size, and look absolutely insignificant and absurdly different from the large specimens of *C. albonotatus*, Tick., which I have received from Mr. Stuart Baker from Cachar. This bird is very common in Kanara, and its almost metallic cry of four notes is heard nightly from February to May. I have taken many nests in March, April and May. The eggs differ a good deal in size, were all cream-coloured with round spots of black or purple, quite different from those of any other nightjars I know, and quite different from the eggs of the form *albonotatus* which I received from Sikhim from the late Otto Möller.

1095. CAPRIMULGUS INDICUS, Lath.

This is the rarest of the Kanara goatsuckers, but I have obtained specimens and heard its easily distinguishable call pretty well all over the district in the thick forest. Its call is either "tuk tuk" constantly repeated, or this with an occasional "tukkoo tukkoo." I have taken eggs in the Sirsi taluka in April.

1099. BATRACHOSTOMUS MONILIGER, Lay.

This bird is confined to the evergreen forests on the Ghats and just below them, but I do not think it is very rare, as I have constantly heard its wailing cry round my camp at Anshi, Nilkund, Kutgul, Gairsoppa, and other places where there are evergreens. It never begins to call, however, till it is almost quite dark, and at that time sits in the thickest trees or bushes. I have again and again followed it unsuccessfully in the moonlight, and have only once succeeded in shooting it. On another occasion I could have killed one, but it was within six yards, and the shot would have blown it to pieces. I have twice come across it in daylight, but on neither occasion had I a gun with me.

1100. HARPACTES FASCIATUS, Penn.

A permanent resident generally distributed over all the forest area except the extreme eastern portion. It is common in the evergreens at Karwar in the rains. I have taken numerous nests : the earliest was in March at Kutgul, but above Ghats the end of April and May are the commonest months. The nest holes were all large openings and generally in very rotten wood, and the heights varied from ten to about twenty feet. The cock sits on the eggs as well as the hen, and they are very shy at returning to a nest when any one is about, though they keep in the neighbourhood. I remember one case at Supa when I had started a cock from some tree (I could not see which), I watched him for over an hour, during which time he mostly sat without moving; he then flew away. As I had seen nothing of the hen, I considered that there was no use waiting longer, and strolled on in the direction he had come from. I noticed a broken branch on a tree about nine feet from the ground, and as it was so low, I climbed up and put my hand on the branch, which broke clean off the moment my fingers touched it, and left three beautiful fresh eggs on the top of a heap of rotted wood, which fortunately prevented their falling to the ground. All the eggs I have found have been a rich cream colour.

1104. CUCULUS CANORUS, Linn.

The common cuckoo is a rare bird in Kanara. I have only twice shot it ; both were in the Kumta taluka in November. I also once heard its note at Nilkund in February.

1107. CUCULUS MICROPTERUS, Gould.

This cuckoo is generally distributed in the forest portion of the district from February to May, and is probably found at all seasons. It is however a shy bird, and would generally be passed over were it not for its clear four-noted metallic cry, one of the finest I know, and always connected in my mind with the long solitary wait one frequently has had when beating for big game. In the north of the Sirsi taluka on the 4th April, 1894, I obtained an egg I consider to belong to this bird. It was in the nest of a *malacocercus*, and is clearly a cuckoo's. It is of a bright blue colour, not nearly so dark as the egg of *Hieroccoccyx varius.* I was camped at the place for several days, and though I saw and heard *C. micropterus* constantly, I never saw any other cuckoo in the neighbourhood.

1109. HIEROCOCCYX VARIUS, Vahl.

A permanent resident, fairly distributed all over the district, and not uncommon about Karwar in the rains.

1112. CACOMANTIS PASSERINUS, Vahl.

Very common in the Northern portion of the district, *viz.*, Halyal, Supa, and Karwar and as far south as Ankola. I have only once come across it in the cold weather at Sirsi and once at Kumta. In the rains at Karwar across the Kalanuddi its note practically never ceases, and there were always a couple on the little hill in which the Collector's bungalow at Karwar is situated. I have taken many of their eggs. They were laid in every case in the nests of *Orthotomus sutorius.* On one occasion I noticed a pair flying about most excitedly round a bush in which I knew there was a nest of *O. sutorius*, and on waiting till they had left, examined the nest, which I found to contain three blue eggs of the ordinary type, and a white one considerably but not very strikingly larger, and very similarly marked with brown spots. The majority of *O. sutorius* in Kanara lay eggs with a blue ground, and although I have taken this cuckoo's eggs eight or ten times in their nests, in every case whether the tailor-bird's eggs were blue or white, the cuckoo's had a white ground. This is remarkable, as all the previous records of the egg of this cuckoo are to the effect that the egg has a blue ground.

1114. PENTHOCERYX SONNERATI, Lath.

This cuckoo is a permanent resident, but is not nearly so common as the last. In the rains it is fairly common about Karwar, and I have noticed it occasionally at all seasons all over the district. It is a very noisy bird with a clear call somewhat resembling that of *H. varius*, but not so loud or long, and omitting the very high notes at the end. In August, 1894, I saw a young one being fed by a pair of *Ioras*, and in April of that year I found at Sirsi a nest of *O. fuscicaudata* containing two eggs of an ordinary bright coloured type and also a dull red egg of quite a different texture. This belonged, I have no doubt, to this bird, as it is almost similar to one from the Barnes' collection which was extracted from a shot bird.

1117. Surniculus lugubris, Horsf.

This bird is a permanent resident in Kanara, and I do not think very rare, but it is often passed over owing to its similarity to a kingcrow. I do not, as a rule, want to shoot kingcrows, but I have on two occasions shot one of these birds when I intended to kill a *Buchanga*. It is occasionally seen in Karwar in the rains, and has a fine clear note. I have shot it in various places along the coast and also in the Siddapur taluka. On one occasion (26th May, 1889), I saw three sitting on a huge silk-cotton tree : they were calling shrilly, and spread their wings and tails, showing the white bar distinctly.

1118. Coccystes jacobinus, Bodd.

I have only once obtained this species in Kanara. It was an immature specimen shot at Gairsoppa in October, 1893. I remember seeing another across the river from Karwar in the beginning of the rains.

1120. Eudynamis honorata, Linn.

Generally distributed all over the district. I have obtained eggs above Ghats in the month of March from nests of *Corvus macrorhynchus.*

1122. Rhopodytes viridirostris, Jerd.

Common everywhere, both above and below the Ghats, where there is forest. I have taken several nests about Karwar in the month of August, and in other places (both above and below the Ghats) in April. The nests were, as a rule, built in thick low bushes some three or four feet from the ground, but in one case I found a nest in a very thick bamboo clump in open forest about twenty feet from the ground. The nests are slight, composed of twigs and lined with green leaves. In one case I obtained three eggs, but in all the others there were only two.

1129. Taccocua leschenaulti, Less.

This is a very rare bird in Kanara. Aitken obtained a specimen north of Karwar, and I saw one near Honawar in December, 1888, or January, 1889.

1130. Centropus sinensis, Steph.

The crow pheasant is generally distributed all over Kanara, and is fairly common everywhere. It breeds in March and April.

1133. Centropus bengalensis, Gmel.

I have never obtained a specimen of this bird, but I saw one at Kumbarwada in Supa on 12th March, 1896, and I feel certain I have also seen it at Anshi. Mr. Aitken also saw it at Castle Rock still further north in Supa.

1134. Palæornis eupatria, Linn.

I have never managed to shoot this bird in Kanara, so cannot be sure whether it is this form, or, as in Khandesh, *P. nipalensis*, Hodgs., which is obtained. It is very rare, and I have only seen the bird twice. They were both in the south of the district. On the 18th December, 1889, I saw a pair at Siddapur in the large evergreen grove on the Bunwasi road, and again on the 30th December, 1895, I saw a single bird at Kodkani flying over the Gairsoppa falls.

1138. Palæornis torquatus, Bodd.

By no means a common bird in Kanara. A few may be found along the coast from near Karwar to Bhutkul, being commoner about Gokern and Honawar. The bird is also moderately common about Halyal and in the east of the district as far west as Sirsi. I have found it breeding in February along the coast.

1139. Palæornis cyanocephalus, Linn.

By far the commonest parroquet in Kanara, being found everywhere from north to south and east to west. It breeds abundantly in February and March.

1143. Palæornis columboides, Vig.

Common through all the thicker forests in Kanara, both above and below the Ghats, becoming scarce towards the east, and absent from the extreme east of Mundgode and Halyal. It breeds in February and March generally in a hole in the top of a pollard tree adjoining thick forest. The eggs vary in size, but are very similar to those of *P. torquatus*.

1150. Loriculus vernalis, Blyth.

A permanent resident, but shy and silent and would be frequently overlooked if it was not for its pretty little cry as it flies off from some thick tree. I have found it everywhere except in the extreme east of the district. I have taken a good many of its nests ; all were in supari palms left dead in the gardens, and they were in holes in the rotten wood. The eggs are very round and glossless and much discoloured by the rotten wood ; they vary from two to four in number.

1152. Strix flammea, Linn.

The only specimen of this owl I have ever seen in Kanara was sent to me alive from the light-house opposite Karwar. It flew into this during the rains of 1889.

1157. Asio accipitrinus, Pall.

I saw a single specimen of the short-eared owl at Halyal on the 12th February, 1896, among some long grass.

1160. Syrnium indrani, Sykes.

I have only seen this owl in the neighbourhood of Kutgul, and while beating for game. I shot a specimen on the 1st April, 1893, and I have seen others in later years.

1161. Syrnium occellatum, Less.

This owl is only found in Kanara along the extreme east of the district. There are always a pair which breed in the fine mango avenue at Bunwasi, east of Sirsi, and I have seen others at Halyal, Mundgode, and while beating in the forests near Dasinkop.

1164. Ketuba ceylonensis, Gkel.

Distributed all over the district both above and below the Ghats. It is really common along the numerous forest streams. I have taken eggs in January and February below the Ghats.

1168. Bubo bengalensis, Frankl.

Not common in Kanara. A pair are generally to be found on the side of the hill at Sadasheogarh, north of Karwar. I obtained a young one unable to fly at Bunwasi. I have also heard the note of what I took to be this owl in other places.

1170. Huhua nipalensis, Hodgs.

I have seen a large horned owl, which was probably this bird, at Anshi in the Supa petta, and heard its call in other places. The only one that ever came within shot of me flew into a tree close to me while I was sitting up for a panther with a rifle in my hand. It was too dark to see the bird distinctly.

1178. Scops bakhamœna, Penn.

This little owl is rare. I have only seen it in the neighbourhood of Karwar, where I took a nest with three eggs on the 29th January, 1893. It was in a hole in a tamarind tree on the edge of the forest, and about ten feet from the ground.

1180. Athene brama, Temm.

This little owlet is found occasionally on the coast from Karwar to Bhutkul. It is a permanent resident, but not common anywhere. It is also found in the extreme north-east of the district, but is absent from all the central portions.

1184. Glaucidium radiatum, Tick.

This is a common owl throughout the district wherever there is forest. I have taken eggs from February to April in many places. A pair used to breed every year in a hole in a small cocoanut tree in front of the Forest bungalow at Kudra.

1187. Ninox scutulata, Raff.

This owl is, I think, by no means very uncommon throughout Kanara, but is very shy and does not come out till it is almost quite dark. In the breeding season it is a very noisy bird with a clear cry, which can be heard for miles. It is generally uttered by both birds together, and resembles "coo ooo, coo, ooo, coo ooo," repeated very fast. It is a denizen of thick jungle generally on the hills. The birds flit about like nightjars. I have never taken eggs in Kanara, but they must breed in March as proved by dissecting specimens shot.

1189. Pandion haliaetus, Linn.

Noticed occasionally on the coast, and also on the large rivers below the Ghats. I have only noticed it between October and February.

1191. Otogyps calvus, Scop.

Noticed occasionally at all seasons in all parts of the district. It must be a permanent resident, but in Kanara I have never come on a nest.

1194. Gyps indicus, Scop.

Noticed on a very few occasions in various parts of the district, but on only one occasion were there more than two or three together. There are many suitable cliffs in the district, but only once have I seen the bird apparently breeding. This was on the 30th December, 1893, and a pair kept entering a sort of hollow in the cliff half way down below the bungalow on the British side of the Gairsoppa falls. With a glass I could discover what looked like a nest, but, of course, in a quite unapproachable situation.

1196. Pseudogyps bengalensis, Gm. (Syst. Nat.)

This vulture is very common everywhere in Kanara. It breeds in December and January, sometimes singly and sometimes several together in the forest. I have seen hundreds of nests.

1197. Neophron ginginianus, Lath.

Moderately common along the east of the district, where it breeds in February. Occurs also as a straggler along the coast occasionally at Honawar and Kumta, and I once saw it at Nilkund on the edge of the Ghats. It is, however, absent from by far the greatest part of the district.

1203. Aquila vindhiana, Frankl.

I obtained a single specimen of this eagle at Dasinkop in the extreme east of the district on the 7th March, 1890, and have once or twice seen specimens, I consider to have belonged to this, also in the extreme east.

1205. Aquila maculata, Gmel. (Syst. Nat.)

I have never obtained a specimen of this eagle. I have, however, several times in the east of the district seen a dark eagle with some white on its back and wings. They were in the neighbourhood of tanks, and I have noticed them from January to May. This eagle may, however, possibly have been *A. hastata*, which I have shot from the nest in the adjoining Mysore territory.

1207. Hieratus fasciatus, Vieill.

I saw a single male specimen of this bird at the Gairsoppa Falls in December, 1895. I saw it several times and possibly its mate may have been sitting somewhere among the cliffs around.

1208. Hieratus pennatus, Gmel. (Syst. Nat.)

Seen occasionally along the coast in the cold weather. I have also on three occasions seen specimens above Ghats.

1210. Ictinaetus malayensis, Reinn.

By no means uncommon along the southern portion of the coast about Bhutkul, and occasionally seen all along the line of Ghats. A female I shot at Manki on the 26th January, 1890, would have laid in a very few days, and a fine male I shot near Bhutkul in December, 1893, was also breeding. I have, however, never come across a nest. The bird is however a cliff-builder, and in Kanara cliffs are surrounded by dense jungle and difficult to get at.

1211. Spizaetus cirrhatus, Gmel. (Syst. Nat.)

This eagle is common in the forests below Ghats, and also in those to the east of the district. I have taken its nest several times, generally in silk-cotton trees, and found in every case one egg or young. The eggs were taken in January and February.

1216. Circaetus gallicus, Gmel. (Syst. Nat.)

Noticed occasionally along the coast and in Siddapur, in the cold weather, and about Halyal in the hot weather. I have seen no signs of this bird breeding.

1217. SPILORNIS CHEELA, Lath.

By far the commonest of the hawk eagles in the district and found at all seasons in all the moist forests, never being found far from water. Its nests are hard to find, being mostly in very thick forests along a stream. The form we get in Kanara is the smaller form with faint barring on the breast called by Sharpe *S. melanotis*. An egg believed to belong to this species was figured in volume 3 of this Journal by the late Mr. Barnes. I think, however, some mistake must have occurred as the egg is indistinguishable from eggs in my collection of *Pernis cristatus*, and is not nearly large enough for the species.

1220. BUTASTUR TEESA, Frankl.

A migrant to the district found very commonly along the coast, and very sparingly elsewhere, from November to March when it disappears.

1224. HALIÆTUS LEUCOGASTAR, Gmel. (Syst. Nat.)

The white-bellied sea-eagle is very common along the coast and some distance up all the rivers below the Ghats at all seasons. They seem invariably to breed in the same nest yearly. At Karwar a pair breed in the Caserina plantation, another pair at Karwar head, another pair on a peak beyond Godhalli, while there are generally four pairs on the various islands in the harbour. It is the same all the way down the coast as far as Bhutkul. I have never been able to land at Nitrani (Pigeon Island) myself, but I have several times sent there for eggs, and the most I have ever received at a time has been seven pairs, and the boatmen said there were never more than a dozen pairs breeding on the Island. I have always got my eggs from there in October, and even at that date many were much incubated. I have, however, got eggs at Karwar as late as the beginning of February. The bird brings a perfectly wonderful amount of food to its young. At Gokern, where there used to be a large nest close to the bungalow, the birds constantly arrived with food, and the villagers declared had a strong partiality to their chickens, and objected to their breeding there.

1226. POLIÆTUS ICHTHYÆTUS, Horsf.

I have only seen this bird about the small tanks at Yellapur and to the east of Mundgode. It is shy and I only obtained one specimen, but I invariably saw the bird at the Sanwalli tank near Mundgode whenever I visited it.

1228. Haliastur indus, Bodd.

The Brahmany kite is common along the coast from north to south and noticed occasionally throughout the above Ghat portion. It remains all through the rains at Karwar. I have seen the birds building as early as the end of October, but all the eggs I have taken have been in January.

1229. Milvus govinda, Sykes.

The kite is generally distributed through Kanara, being a permanent resident above the Ghats, at all events in the east of the district. At Karwar it leaves about the end of May, and none are seen till September. It breeds anytime from November to March.

1230. Milvus melanotis, Temm. and Schleg.

I have only seen this kite on three occasions in Kanara. I obtained a very fine male at Halyal on the tank on the 6th February, 1896, with a wing of 19½ inches and a total length of 24½ inches. I also twice (January, 1890, and December, 1895,) saw a single specimen on the coast to the south of Honawar.

1232. Elanus cæruleus, Desf.

This pretty little kite is very rare in Kanara. I saw a pair on the 25th March, 1895, at the Gangawati tank, which, from the way they were chasing other birds, were apparently breeding, though I could not find their nest. I have seen the bird singly some eight or ten times in Halyal, Mundgode and along the coast.

1233. Circus macrurus, S. G. Gmel.

Moderately common during the cold weather from November to March both above and below the Ghats wherever there is open country.

1234. Circus cineraceus, Mont.

Less common than the preceding except about Siddapur, where it is abundant in the cold weather. Elsewhere only noticed occasionally on the coast from Ankola to Bhutkul.

1237. Circus aeruginosus, Linn.

The marsh harrier is very common along the coast wherever there is swampy land. Above Ghats it is occasionally seen about tanks and rice fields.

1239. Buteo ferox, S. G. Gmel.

I have perhaps on half-a-dozen occasions seen this bird ; they have all been between November and April, and have been either on the coast or in the east of the district.

1244. Astur badius, Gmel. (Syst. Nat.)

Generally distributed through the district, but by no means common. I have taken nests in March and April. I have no recollection or record of having seen it at Karwar in the rains.

1246. Lophospizias trivirgatus, Temm.

This fine bird is not common in Kanara. It is, however, a permanent resident in all the forests above Ghats from the extreme north to the south of Siddapur. I once saw in the distance on the river below Gairsoppa a bird, I believe, to have been this, but except this doubtful case I have never seen it below the Ghats. In 1893, I obtained three nests ; the first was on the 7th April at Sampkund in the Sirsi taluka, and the nest was high up on a tall, almost branchless tree in the large evergreen "kan." It was a dreadful tree to climb and I was much surprised to find a man casually passing willing and able to climb it. The second was on the 15th April in a village near Manchikeri in the Yellapur taluka. This was about 40 feet up a leafless tree outside a "kan" of very tall trees. A villager brought me the eggs, and hours afterwards when I went to the spot, the hen was sitting on the empty nest, and refused to leave it till many stones had been thrown at her. The nest was a massive structure of sticks, and, the man said, was not lined with leaves. The third nest was at Birchia in Supa, and was in bamboo jungle on a branchless tree about forty feet from the ground, and quite unapproachable if a tall bamboo had not crossed the tree close to the nest. It was found on the 8th May. Each nest contained two eggs, but in that of the 8th May, the eggs contained dead and rotten young birds which ought to have been hatched at a much earlier date.

1249. Pernis cristatus, Cuv.

To my surprise I have always found the honey buzzard rare in Kanara, and I have seen no signs of its breeding. I have noticed odd specimens from December to May both above and below the Ghats.

1254. Falco peregrinus, Tunstall.

A few peregrines visit the district from November to February. I have seen them only on the coast and about the tanks in the north-east of the district.

1255. Falco peregrinator, Sundev.

A pair of these falcons kept about the Gairsoppa falls at Christmas, 1893. I also saw a female at Sirsi on 1st May, 1889, and a male at Ankola on the 2nd June of the same year.

1262. Erythropus amurensis, Gurney.

This pretty little falcon appears in some years in immense scattered flocks in November and December. All seen have been along the coast, and the years 1891 and 1895 were years of great abundance, though I saw a pair in 1893. As a rule they do not show till the evening, when one after another appears and flies over and over the rice fields catching moths and beetles. They fly very fast, and continue flying till it is almost too dark to shoot.

1265. Tinnunculus alaudarius, Linn.

The kestrel visits Kanara both above and below Ghats from November to March, but it is not common and avoids all the thick forests. I have seen none on the cliffs in April and May, at the time they were breeding in fair numbers in the Nassic districts further north, and I do not think any remain in Kanara to breed.

Crocopus chlorigaster, Blyth. (Hume's Cat., No. 773.)

This pigeon is not common in Kanara, but a few are found through the up-Ghat portion of the district towards the east and north. I have also noticed them below the Ghats at Agsar and Kudra. I have, above Ghats, taken their eggs from February to May.

Osmotreron bicincta, Jerd. (Hume's Cat., No. 774.)

This pigeon is very local in Kanara and I have only seen it at a few places along the coast from Ankola as far south as Murdeshwar. Its cry is a hoarse one and not like the musical notes of *C. chlorigaster* and *O. malabarica.* It breeds in February and March. I have seen more in the neighbourhood of Mirzan than in any other place.

Osmotreron malabarica, Jerd. (Hume's Cat., No. 775.)

This is the common green pigeon of Kanara, and is found in numbers from the coast to about as far east as Birchia. It is rare in the east of Sirsi, and I have not seen it in Mundgode or Halyal. It breeds from January to April, making its nest as a rule in the tops of the pollard trees about fifteen feet from the ground.

CARPHOGA AENEA, Linn. (Hume's Cat., No. 780.)

Well distributed over the central portion of the district as far north as Yellapur and as far east as Sirsi. It is also found commonly below the Ghats among the hills from Kutgal to Sunksal, and I have seen numbers in February in the Arbail Ghat. As a rule, however, it avoids the ridge of the Ghats. I obtained an egg at Siddapur in February, 1889, and I took two nests on the 12th and 13th March at Tyagli in Sirsi. The nests were in a pollarded tree in evergreen "betta," and were one twenty and the other twenty-five feet from the ground. The nests were slight and composed of thin twigs, and there was of course only one egg in each nest. I have had other eggs brought to me.

CARPOPHAGA CUPREA, Jerd. (Hume's Cat., No. 781, bis.)

This fruit pigeon, which has no metallic green back and is larger, is not so generally distributed as *C. aënea.* It is as a rule restricted to the face of the Ghats from Gairsoppa to Anshi. I have noticed it also about Kutgul, but never any distance from the crest of the Ghats inwards. While on the wing this species much resembles the last, but its note is quite distinct, and somewhat resembles the cry of the common Kanara monkey. It breeds in February, and I have obtained eggs at Devimane, and on the edge of the Ghat near Manchikeri. The egg is very similar to that of *C. aënea.*

PALUMBUS ELPHINSTONII, Sykes. (Hume's Cat., No. 786.)

This pigeon is rare and I believe restricted to the north-west corner of Supa. I have only come across the bird at Juggulbet and between Anshi and Kumbharwada in May. Mr. Aitken however informs me it is more common further north about Digi on the Portuguese frontier.

COLUMBA INTERMEDIA, Strickl. (Hume's Cat., No. 788.)

The Indian blue-rock is very common at the Gairsoppa falls, where hundreds breed on the cliffs and afford capital shooting. They are also found on some of the islands along the coast and at Halyal.

TURTUR MEENA, Sykes. (Hume's Cat., No. 793.)

The large Indian turtle dove identified by me as the form *meena*, is common above Ghats from November to April. I also once saw a small flock near Ankola. I once started one out of a thick small tree, and found in it a pigeon's nest with one egg which may have belonged to this bird. It is, however, larger than others I have received from elsewhere. It certainly does not generally breed in the district.

TURTUR SURATENSIS, Gm. (Hume's Cat., No. 795.)

A very common bird everywhere, building from February to May.

TURTUR RISORIUS, Linn. (Hume's Cat., No. 796.)

I have only noticed this bird about Halyal in the extreme north-east portion of the district. It was common in February, and I saw a few specimens in April. It is absent from the rest of the district.

TURTUR TRANQUEBARICUS, Hern. (Hume's Cat., No. 797.)

On two occasions I saw this bird near Halyal in February, and Mr. Aitken informs me he saw a small flock at Ankola in January, 1894.

CHALCOPHAPS INDICA, Linn. (Hume's Cat., No. 798.)

Fairly common through all the forests except those in the extreme east of the district. It has a mournful wailing call which is audible for a long distance. I have taken eggs at Sirsi in March, and at Karwar in the end of the rains. They may be known from the eggs of all the other doves by their pink colour, almost the shade of a trogon.

PAVO CRISTATUS, Linn. (Hume's Cat., No. 803.)

Peafowl are rare in Kanara and are undoubtedly disappearing. They used to be common along the Digi Ghat, but the Custom Sepoys have shot them out. There are still a few in the east of the Mundgode Petta, and I have seen or heard a few at various places both above and below the Ghats. I got some eggs near Karwar in September, 1894.

GALLUS SONNERATI, Tem. (Hume's Cat., No. 813.)

Jungle fowl are still common everywhere in the forests above and below Ghats, and would increase enormously if they were not snared round almost every patch of rice. They breed from February to May, but appear to lay very few eggs, the most I have ever found being five. These, oddly enough, were laid on the top of a dead stump two or three feet from the ground.

GALLOPERDIX SPADICEUS, Gm. (Hume's Cat., No. 814.)

Very common in every portion of forest in Kanara. It breeds from March to May, and out of some fifty nests I have never found more than four eggs in a nest, and only on one or two occasions have I found more than three.

FRANCOLINUS PICTUS, Jard. & Selby. (Hume's Cat., No. 819.)

Found sparingly along the extreme east of the district from Halyal to Siddapur, but I do not think they occur in any place more than ten miles from the border.

ORTYGORNIS PONDICERIANUS, Gm. (Hume's Cat., No. 822.)

A rare bird in Kanara. There are a few in the neighbourhood of Ankola on the coast extending some five or six miles north of it, and I once saw a single specimen at Sirsi.

PERDICULA ASIATICA, Lath. (Hume's Cat., No. 826.)

I have shot this quail in the forests east of Halyal, and I have seen what was either this or the next species at Bhutkul. Bush quail are, however, very scarce in Kanara.

MICROPERDIX ERYTHRORHYNCHUS, Rykes (Hume's Cat., No. 828.)

This quail I have only found in the neighbourhood of Bunwasi, in the east of Sirsi. I obtained eggs from there taken in September.

COTURNIX COMMUNIS, Bonn. (Hume's Cat., No. 829.)

This quail visits Kanara in the cold weather, and a few may be obtained along the whole east portion from Halyal to Siddapur. Below Ghats it is rare. I have seen it once or twice at Karwar, Kumta, Honawar, and both above and below the Malemane Ghat.

COTURNIX COROMANDELICA, Gm. (Hume's Cat., No. 830.)

This quail is abundant at Halyal, where it breeds in September. I have also obtained it occasionally in the east of the district as far south as Siddapur. I once saw it below the Ghats at Kumta on the 10th February, 1889.

TURNIX TAIGOOR, Sykes. (Hume's Cat., No. 832.)

A permanent resident, being occasionally seen and often heard at Karwar during the rains. I have noticed it all over the district in he cold weather. I have several times obtained eggs at Halyal.

TURNIX JOUDERA, Hodgs. (Hume's Cat., No. 834.)

Seen once or twice in thick patches of high grass among the forests in Supa and Halyal in April and May.

TURNIX DUSSUMIERI, Tem. (Hume's Cat., No. 835.)

Obtained once at Halyal in April.

SYPHEOTIDES AURITA, Lath. (Hume's Cat., No. 839.)

I have once or twice shot florican at Halyal in April.

CURSORIUS COROMANDELICUS, Gm. (Hume's Cat., No. 840.)

Rare in the district. In the cold weather I have seen a few in the bare rocky hills at Gokern and Bhutkul. Above Ghats I have seen the bird at Halyal and Sirsi ; at the latter place I obtained fresh eggs in April.

SQUATAROLA HELVETICA, Linn. (Hume's Cat., No. 844.)

I saw large flocks of this bird in December, 1889, and 1895 at Honawar. I also saw some in December, 1893, at Bhutkul, and in February, 1894, at Belikeri.

CHARADVIUS FULVUS, Cuv. (Hume's Cat., No. 845.)

The eastern golden plover is fairly common all along the coast from Karwar to Bhutkul. I have also seen flocks near Siddapur also in the cold weather, and in April and May I have seen a few at Halyal in nearly full summer plumage.

ÆGIALITIS GEOFFROYI, Wagl. (Hume's Cat., No. 846.)

I shot a pair of this plover out of a large flock at Honawar on the 21st December, 1895. I think I saw a flock once at Karwar in October, but did not obtain a specimen.

ÆGIALITIS MONGOLA, Pall. (Hume's Cat., No. 847.)

I shot 7 birds out of a large flock of this species at Honawar on the 8th December, 1895, and have seen flocks also at various other places on the coast.

ÆGIALITIS CANTIANA, Lath. (Hume's Cat., No. 848.)

In December, 1895, I saw a large flock of this bird at Murdeshwar, and I obtained specimens in December, 1890, at Honawar.

ÆGIALITIS DUBIA, Scop. (Hume's Cat., No. 849.)

This plover I have occasionally seen on the banks of tanks and in the marshes along the coast from December to the beginning of April.

LOBIVANELLUS INDICUS, Bodd. (Hume's Cat., No. 855.)

Common all over the district, breeding abundantly in March and April.

LOBIPLUVIA MALABARICA, Bodd. (Hume's Cat., No. 846.)

This plover is, as might be expected, rather scarce in so thickly wooded a district. I have seen a small flock in the rains in Karwar, and a few both above and below the Ghats in the cold weather and also in the hot. I have taken eggs in April and May on several occasions. For two consecutive years I took a clutch at Halyal, which, instead of being normally coloured, were a rich pink marked with darker pink and reddish-brown. They were no doubt the produce of one pair of birds as they were obtained in the same field. I once obtained two similarly coloured eggs at Sirsi.

Œdicnemus scolopax, S. G. Gm. (Hume's Cat., No. 859.)

This bird is found along the coast, but is rare there. In the east of the district, especially about Halyal, it is more common. I once obtained a nest with two eggs. It was at Halyal on the 28th April, 1895.

Scolopax rusticola, Linn. (Hume's Cat., No. 867.)

I have only once seen a woodcock in Kanara. This was on the 11th March, 1896, while beating for big game at Kumbharwada in Supa. I have heard of some four or five others being seen. It is however a very rare visitor.

Gallinula sthenura, Kuhl. (Hume's Cat., No. 870.)

Gallinula cœlestis, Cuv. (Hume's Cat., No. 871.)

Kanara is not a good district for snipe. On the coast they come in about the third week of October ; there are a few places from the north of Karwar to Bhutkul where moderate bags can be made till the middle of February. From ten to fifteen brace is considered a very good bag.

Above Ghats they are on the whole scarcer, but a few may be got in almost any of the late rice crops, the best time there for them being from the middle of January to the first week of April. Pintails are commoner on the coast and about Sirsi than fantails, and I find 107 pintails recorded against 22 fantails. About Halyal, however, in February, 1896, I shot 25 fantails and only one pintail. The latest date I have seen snipe in Kanara is the 25th April.

Gallinago gallinula, Linn. (Hume's Cat., No. 872.)

Jack snipe are much scarcer than either of the preceding. A few are however found both on the coast and above Ghats.

Rhynchæa capensis. (Hume's Cat., No. 873.)

The painted snipe is not common. I have, however, shot a few both above and below the Ghats from November to February. I have never however found them breeding in Kanara.

Terekia cinerea, Guld. (Hume's Cat., No. 876.)

I have only once met with this bird. It was on the 10th December, 1895, and I shot one out of a small flock at Honawar. They were on a sand bank in the Gairsoppa river.

NUMENIUS LINEATUS, Cuv. (Hume's Cat., No. 877.)

I have once or twice seen the curlew along the coast in the cold weather, but is very scarce.

NUMENIUS PHÆOPUS, Linn. (Hume's Cat., No. 878.)

Not very uncommon along the shore from Ankola to Gokern. I have several times shot them there.

MACHETES PUGNAX, Linn. (Hume's Cat., No. 880.)

A rare winter migrant. I shot one at Honawar out of a small flock in November, 1889.

TRINGA MINUTA, Leisl. (Hume's Cat., No. 884.)

Rare. I have however several times seen it in marshes near the coast.

ACTITIS GLAREOLA, Linn. (Hume's Cat., No. 891.)

A common winter migrant, being found in small numbers all over the district both above and below the Ghats. I saw one specimen at Supa as late as the 15th May, 1893.

TOTANUS OCHROPUS, Linn. (Hume's Cat., No. 892.)

Much less common than the last, but equally distributed.

TRINGOIDES HYPOLEUCUS. (Hume's Cat., No. 893.)

This bird arrives in Karwar very early, and I have seen a specimen there as early as the 3rd August. There it haunts the seashore, particularly the rocky portions. It is also generally distributed sparingly over the whole district, and I have seen it at Karwar as late as the 15th May.

TOTANUS GLOTTIS, Linn. (Hume's Cat., No. 894.)

Noticed only on the coast, and sparingly from November to February.

TOTANUS STAGNATILIS, Bechst. (Hume's Cat., No. 895.)

Once obtained by me at Honawar on 10th November, 1889.

TOTANUS FUSCUS, Linn. (Hume's Cat., No. 896.)

I saw three specimens of this species in the Kumta taluka in November, 1890.

TOTANUS CALIDRIS, Linn. (Hume's Cat., No. 897.)

I once noticed this species at Majali, near Karwar, in November, 1893.

PARRA INDICA, Lath. (Hume's Cat., No. 900.)

Very abundant in all the tanks above Ghats, breeding in the latter part of the rains.

HYDROPHASIANUS CHIRURGUS, Scop. (Hume's Cat., No. 901.)

Equally common with the last in the tanks in the east of the district breeding also in the rains.

PORPHYRIO POLIOCEPHALUS, Lath. (Hume's Cat., No. 902.)

Common in some years on the tank at Halyal, and that of Mavinkop in the same neighbourhood.

FULICA ATRA, Linn. (Hume's Cat., No. 903.)

I have only twice come across the coot in Kanara. I shot one on the 8th December, 1893, on the river near Honawar, and I saw a pair in January, 1896, at Siddapur.

GALLINULA CHLOROPUS, Linn. (Hume's Cat., No. 905.)

Very common in all the tanks in the Halyal taluka in the cold weather.

ERYTHRA PHŒNICURA, Penn. (Hume's Cat., No. 907.)

Common everywhere throughout the district. Breeds in Karwar in the rains.

RALLINA EURYZONOIDES, Lafr. (Hume's Cat., No. 912.)

I have only noticed this bird in the neighbourhood of Karwar. A pair used to live in the jungle there below the Collector's bungalow. Their note, a very extraordinary one, was generally uttered after dark, but occasionally in the early morning. Again and again, in the grey morning, I have tried to stalk them, but only once managed to get a shot and lost the bird though wounded. I obtained a single specimen however at Sadasheogarh, which took refuge in the bungalow there on the 6th June, 1894, during a severe thunderstorm. The bird no doubt breeds in Kanara, and I obtained eggs at Karwar which I have little doubt belonged to the bird, but of course useless being unauthenticated.

HYPO-TÆNIDIA STRIATA, Linn. (Hume's Cat., No. 913.)

Is common about Karwar in the rains, and I have occasionally come across it while snipe shooting in the cold weather. Above Ghats it breeds in the "wangan" or summer rice, and I took two nests at Supa with seven and six incubated eggs in May. I have also taken many nests about Karwar in July and August.

LEPTOPTILUS ARGALUS, Lath. (Hume's Cat., No. 915.)

I have once noticed this bird in the east of Sirsi in the cold weather.

DISSURA EPISCOPA, Bodd. (Hume's Cat., No. 920.)

Occasionally noticed in the east of the district from February to April. Also once noticed at Gairsoppa (below the Ghats) in October, and at Santgal in Kumta in January. I do not think it breeds in the district.

ARDEA CINEREA, Linn. (Hume's Cat., No. 923.)

Noticed occasionally and generally singly at various places both above and below the Ghats from October to April.

ADREA PURPUREA, Linn. (Hume's Cat., No. 924.)

Noticed on some seven or eight occasions singly both above and below the Ghats.

HERODIAS INTERMEDIA, Hass. (Hume's Cat., No. 926.)

Occasionally noticed in the cold weather, singly at Halyal, and on one occasion at Siddapur, and once at Gokern.

HERODIAS GARZETTA, Linn. (Hume's Cat., No. 927.)

Moderately common from November to April, both above and below the Ghats.

DEMIEGRETTA GULARIS, Bosc. (Hume's Cat., No. 928.)

I have noticed this bird in November and December once or twice on the coast near Kumta and Honawar.

BUBULCUS COROMANDUS, Bodd. (Hume's Cat., No. 929.)

Noticed in large flocks about Halyal, in February and April, and at that time throughout the Supa Petta. It does not however breed in the district.

ARDEOLA GRAYI, Sykes. (Hume's Cat., No. 930.)

Common everywhere from October to May, leaving the district in the rains for breeding purposes.

BUTORIDES JAVANICA, Horsf. (Hume's Cat., No. 931.)

Sparsely distributed through all the district from October to May, I have never noticed it anywhere in the district during the rains, but I think it is probably resident then.

ARDETTA FLAVICOLLIS, Lath. (Hume's Cat., No. 932.)

While vainly trying to get a shot at a pair of *Goisakius* at Kudra on the 21st May, 1894, I came on a single specimen of this bittern and shot it. I have never seen or heard of any others in the district.

ARDETTA CINNAMOMEA, Gm. (Hume's Cat., No. 933.)

This bird is generally distributed in the rice fields in Kanara. It is a permanent resident and breeds in large numbers about Karwar in the rains, making a small rough grass nest in the rice fields in July and August and laying four or five eggs.

Botaurus stellaris, Linn. (Hume's Cat., No. 936.)

I shot a single specimen of this bird in the Kumta taluka on the 1st December, 1890.

Goisakius melanolophus, Raffl. (Hume's Cat., No. 936 pis.)

This bird is a permanent resident in Kanara and I do not consider it an extremely rare bird. It is, however, the shyest bird I know, keeping to small nullahs and streams surrounded by evergreen woods. When disturbed it flits noiselessly through the thick forest, and though alighting only a short distance off, again rises before one can get within shot. For four or five days I continually endeavoured to secure a pair at Kudra which kept to the little stream beside the bungalow but failed to get a shot. The first time I saw one there it rose from my feet from the little water hole close to the road and lit some eighty yards off in a thick tree. I followed it from tree to tree without success, and I was equally unsuccessful in trying to stalk or drive the pair on other occasions. I have seen the bird at Supa, Anshi, and Kumbharwada, all in the Supa petta and at Siddapur, all in May, and at many places round Karwar in the rains. I have seen its nest several times. In all cases it was placed in a small tree overhanging a nullah (then, *i.e.*, the rains) full of water. It is a small structure much resembling that of *Ardeola grayi* and generally built of light coloured sticks. It is not concealed at all and generally from fifteen to twenty feet from the ground. In one case I found four eggs hatching (indeed one egg was hatched and the shell under the tree), and in the others two eggs or young. The eggs are white with a faint bluish shade and slightly pointed towards the smaller end. They are laid in the end of July or the beginning of August. When breeding the birds are bold and come freely to the nest.

Nycticorax griseus, Linn. (Hume's Cat., No. 937.)

A rare visitor to Kanara. I saw a large flock one evening in April, 1894, at Yellapur, and I have seen them on the coast in November and December, and at Halyal in April.

Tantalus leucocephalus, Forst. (Hume's Cat., No. 938.)

I have only seen the pelican ibis in the neighbourhood of Halyal in February, and this only on two occasions.

ANASTOCUS OSCITANS, Bodd. (Hume's Cat., No. 940.)

I saw a single shell-eater at the tank in Halyal on 30th April, 1895.

INOCOTIS PAPILLOSUS, Tem. (Hume's Cat., No. 942.)

I have seen this species in the Sirsi taluka in the months of February and April.

FALCINELLUS IGNEUS, S. G. Gmel. (Hume's Cat., No. 943.)

I saw a single specimen of this bird near Siddapur on the 7th January, 1894.

PHŒNICOPTERUS ANTIQUORUM. (Hume's Cat., No. 944.)

A large flock of immature birds came in October, 1893, to the neighbourhood of Karwar. They alighted on the shore and were so fatigued that several were captured alive, being unable to rise again. This is the only instance of the occurrence of the flamingo in Kanara I have ever heard of.

NETTOPUS COROMANDELIANUS, Gm. (Hume's Cat., No. 951.)

Common on all the tanks above Ghats; I have only seen it in the cold and hot weather, but it no doubt breeds there in the rains.

DENDROCYGNA JAVANICA, Horsf. (Hume's Cat., No. 952.)

Common on all the tanks above Ghats and also in places along the coast. It no doubt breeds both above and below Ghats in the rains.

SPATULA CLYPEATA, Linn. (Hume's Cat., No. 957.)

I saw a single specimen of this duck on the Hebutti tank (Sirsi) on the 18th March, 1889, and three others on the Murkwad tank near Halyal on the 9th February, 1896.

ANAS PŒCILORHYNCHA, Forst. (Hume's Cat., No. 959.)

Noticed once or twice on the tanks in the east of Sirsi and Mundgode; probably a permanent resident there.

CHAULELASMUS STREPERUS, Linn. (Hume's Cat., No. 961.)

I have only twice seen Gadwall in Kanara; a small flock on the Murkwad tank (Halyal) in February, 1896, and a single bird near Mundgode in March, 1895.

DAFILA ACUTA, Linn. (Hume's Cat., No. 962.)

I saw five pintail at Honawar in November, 1889, and a single bird at Halyal among a flock of teal on 9th February, 1896.

MARECA PENELOPE, Linn. (Hume's Cat., No. 963.)

I saw a single wigeon at Karwar in September, 1889, and a small flock on the sea outside the bar at Honawar in December of that year.

QUERQUEDULA CRECCA, Linn. (Hume's Cat., No. 964.)

I have twice seen flocks of teal below the Ghats. They were near Kumta and at Honawar in November and December. I have also seen them in some numbers at Bunwasi in the east of Sirsi in March, 1889 and 1890.

QUERQUEDULA CIRCIA, Linn. (Hume's Cat., No. 965.)

Fairly common in all the tanks to the east of the district in the cold weather, and I have twice seen them near Honawar on the coast at the same season.

FULIGULA NYROCA, Guld. (Hume's Cat., No. 969.)

I shot a single specimen of the white-eyed duck at Honawar on 3rd December, 1895.

PODICEPS MINOR, Gm. (Hume's Cat., No. 975.)

Common on all the tanks in the east of the district in the cold and hot weathers.

LARUS BRUNNEICEPHALUS, Jerd. (Hume's Cat., No. 980.)

Not uncommon in the cold weather along the coast from Karwar down to the very south of the district.

STERNA BERGII, Licht. (Hume's Cat., No. 989.)

Common in the cold weather along the coast.

STERNA ANÆTHETA, Scop. (Hume's Cat., No. 992.)

Large numbers of these terns appeared on the coast at Karwar in May, 1890, and many were so weak that they could be caught with the hand. In the rains I have several times seen a larger grey tern at the mouth of the Kalanudi, but have never managed to shoot one.

SULA CYANOPS, Sund. (Hume's Cat., No. 999 bis.)

I obtained a specimen of this bird at Sadasheogarh on the 23rd June, 1895. It was blown ashore in a great storm and captured alive.

PHALACROCORAX FUSCICOLLIS, Steph. (Hume's Cat., No. 1006.)

I saw two birds of this species at Halyal in April, 1894.

PHALACROCORAX PYGMÆUS, Pall. (Hume's Cat., No. 1007.)

Noticed at several places above Ghats from January to April.

PLOTUS MELANOGASTER, Penn. (Hume's Cat., No. 1008.)

I saw two "snake birds" on the Sanwalli tank near Mundgode on the 29th March, 1895.

(*To be continued.*)

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART IV.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

(*Continued from page* 724 *of Vol. XI.*)

Genus Proömphe.

Proömphe, Warr., Nov. Zool., iii, p. 316 (1896).

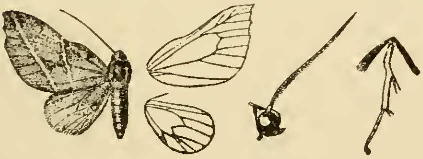
Type.—*P. lobata*, Warr.

Range.—Sikhim.

Palpi smoothly scaled, porrect, and hardly reaching beyond the frons, which is rounded ; antennæ of male minutely ciliated ; hind tibia with tuft of long hair from base on outer side, bent just before the medial spurs, and with the terminal spurs minute. Forewing with the costa lobed at middle ; outer margin crenulate ; vein 3 from before angle of cell ; 5 from above middle of discocellular ; 6 from upper angle ; 7, 8, 9, 10 stalked from before angle, and 11 anastomosing with them to form a single areole. Hindwing with vein 7 from upper angle of cell, which then runs out to an acute angle at 6, then back to the angle of discocellulars ; vein 2 short from before angle ; 3, 4, 5 from angle ; the lower part of cell short.

3594*a*. Proömphe lobata, Warr., Nov. Zool., iii, p. 316.

♂. Pale rufous. Forewing with subbasal and antemedial chestnut triangular spots on costa, the latter at the lobe, and with the pale sinuous antemedial line arising from it ; a pale oblique straight postmedial line from below apex. Hindwing yellowish-fulvous.



Proömphe lobata. ♂ $\frac{1}{1}$.

Habitat.—Sikhim. *Exp.* 32 mm.

Genus Emmesomia.

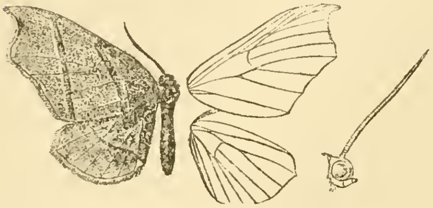
Emmesomia, Warr., Nov. Zool., iii, p. 113 (1896).

Palpi porrect and hardly reaching to extremity of frons, which is smooth and rounded; antennæ of female somewhat laminate ; hind tibiæ with two pairs of spurs. Forewing with the costa arched, the apex produced and acute, the outer margin deeply excised below apex and greatly excurved at middle ; veins 3-4 from angle of cell ; 10

anastomosing with 11 and then with 8-9 to form a double areole. Hindwing with the outer margin produced to a point at vein 7; veins 3-4 from angle; 6-7 stalked; 8 connected with the cell by an oblique bar.

3597*a*. Emmesomia bilineata, Warr., Nov. Zool., iii, p. 118.

♀. Yellowish-grey, thickly irrorated with pale fuscous. Forewing with oblique olive-yellow antemedial line with fuscous outer edge arising from a pink and dark brown costal spot, which is angled inwards; an erect olive-yellow postmedial line with fuscous inner edge arising from a pink and dark brown costal spot; costal edge chestnut; a marginal black mark in the sinus below apex; cilia chestnut at base. Hindwing cream-colour towards outer margin; an indistinct medial fuscous line prominent on underside, which is rufous with the postmedial line and veins black.



Emmesomia bilineata ♀ $\frac{1}{1}$.

Habitat.—China; Khásis. *Exp.* 46 mm.

3600*a*. Cryptoloba olivaria, Swinh., A. M. N. H. (6) xix, p. 165.

♂. Olive-grey. Forewing with black specks and striæ on edge of costa; an indistinct olive-brown sinuous antemedial line with short black line on it at costa; a more prominent postmedial line slightly angled beyond cell, and with black lines on its inner edge, from costa to vein 6 and veins 5 to 2. Hindwing with postmedial straight fuscous line, the area beyond it suffused with fuscous. Underside of forewing fuscous, the apical area and whole hindwing striated with fuscous.

Habitat.—Khásis. *Exp.* 16 mm.

3604*a*. Lobogonia olivata, Warr., Nov. Zool., iii, p. 119.

Hindwing with the outer margin hardly produced to an angle at vein 4. ♀. Pale olive-brown, irrorated with dark brown. Forewing with the base and area beyond the lines suffused with darker olive; straight erect ante-and postmedial dark brown lines; a discocellular blackspeck; a submarginal black spot below vein 6 and speck below vein 2. Hindwing paler and more thickly irrorated; a curved post medial fuscous line.

Habitat.—Khásis. *Exp.* 34 mm.

P. 339. Under **Syzeuxis** insert (syn.) *Aphantoloba*, Warr., Nov. Zool., iii, p. 117 (1896).

3605. SYZEUXIS TRINOTARIA, insert (syn.) *Aphantoloba nigrinotata*, Warr., Nov. Zool., iii, p. 117.

An olive-green form with the black markings stronger, especially the triangular patches on costa of forewing.

3618*a*. SCOTOSIA SERICATA, Butl., A. M. N. H. (5) iv, p. 444 ; *Triphosa corrasata*, Warr., Nov. Zool., iv, p. 73.

♀. Silky grey ; head and prothorax suffused and marked with fuscous ; abdomen with the first two and anal segment tinged with fuscous ; paired dorsal black points on first three segments. Forewing with two subbasal and an antemedial double black line interrupted below cell and less prominently below costa, towards which they are dilated, the second line with rufous middle ; traces of two pinkish waved postmedial lines, becoming black near costa, and the outer expanding into a large black costal patch, and followed by a series of black points on the veins, incurved at vein 5 ; a double submarginal black line filled in with rufous and widely interrupted below costa and middle ; a marginal series of black lunules. Hindwing with two waved subbasal and two indistinct medial lines ; a postmedial crenulate line with points on the veins ; an indistinct double-waved submarginal line interrupted below middle, prominent and filled in with rufous towards inner margin ; a marginal series of black lunules. The ♂ from Japan has the markings slightly more connected and distinct.

Habitat.—Japan ; Khásis. *Exp.* 58 mm.

3619. SCOTOSIA RUBRIDOTATA, insert (syn.) *Triphosa acutipennis*, Warr., Nov. Zool., iii, p. 387, and *Triphosa pallescens*, Warr., Nov. Zool., iii, p. 387.

3636*a*. CIDARIA CONTORTILINEA, Warr., Nov. Zool., iii, p. 121.

♂. Grey, suffused with fuscous ; abdomen with grey segmental lines. Forewing with the base fuscous ; two waved and curved fuscous antemedial lines ; a discocellular spot ; a minutely waved postmedial line, strongly excurved beyond cell and with a broad fuscous band beyond it, with a similar line beyond it ; outer area fuscous, narrowing from costa to inner margin, and with the pale waved submarginal line on it. Hindwing with two antemedial lines ; a discocellular spot ; two postmedial lines slightly angled at middle and with a fuscous band between them; outer area fuscous with traces of a waved submarginal line.

Habitat.—Khásis. *Exp.* 30 mm.

3655*a*. Cidaria subænescens, Warr., Nov. Zool., iii, p. 121.

♀. Head, thorax, and abdomen ochreous and rufous. Forewing brown; two antemedial white lines with blue-grey suffusion between them, the inner angled in cell, the outer acutely angled on vein 2, then incurved; the medial area with four pale waved lines forming annular marks towards inner margin; a curved white postmedial line emitting some teeth inward on the veins; the area beyond it blue-grey; two dark submarginal lunules below costa; a larger dark subapical marginal lunule defined by a white line; a ferruginous lunule above outer angle; a marginal series of dark points. Hindwing whitish suffused with fuscous; traces of numerous waved lines; a black marginal line; cilia brownish; underside much greyer with black cell spot.

Habitat.—Khásis. *Exp.* 34 mm.

3672. Cidaria fluviata, insert (syn.) *Ochyria incospicua.* Warr., Nov. Zool., iii, p. 122.

3679*a*. Cidaria plumbeotincta, insert (syn.) *Perizoma rubridisca*, Warr., Nov. Zool., iii, p. 386, Sikhim.

3680. Cidaria obfuscata, insert (syn.) *Xanthorhoë subbrunescens*, Warr., Nov. Zool., iii, p. 315.

3704. Larentia affinis, insert var. *fulvistriga*, Warr., Nov. Zool., iii, p. 386.

3715. Larentia decorata, insert (syn.) *Perizoma quadrinotata*, Warr., Nov. Zool., iii, p. 122.

3771*a*. Larentia triplagiata, Warr., Nov. Zool., iii, p. 123.

Differs from *L. lacernigera* in the forewing having the postmedial triangular patch on costa much larger and more prominent; a distinct crenulate white submarginal line, with the area beyond it grey, the rest of wing ferruginous-white.

Habitat.—Khásis. *Exp.* ♂ 24, ♀ 28 mm.

3720*a*. Larentia tenuifascia, Warr., Nov. Zool., iii, p. 123.

Grey; head and thorax black-brown; abdomen with white band at base, followed by a black band and series of dorsal black spots. Forewing with the base black-brown with oblique outer edge; a medial black-brown band with waved edges, wide at costa, below which its inner edge is angled, narrow at inner margin, its outer edge angled at middle; a marginal series of black points. Hindwing with fuscous medial line angled at middle.

Habitat.—Khásis. *Exp.* 24 mm.

3724. LARENTIA *truncata*, insert STRIGULATA, Fabr., Ent. Syst., 3, 2, p. 192 (1794), and var. *albimedia*, Warr., Nov. Zool., iii, p. 317; and var. *flavifusa*, Warr., Nov. Zool., iii, p. 387.

3724*a*. LARENTIA CANALICULATA, Warr., Nov. Zool., iii, p. 384. (Pl. A, fig. 18.)

♂. Grey, irrorated with ferruginous-red; thorax suffused with brown. Forewing with ferruginous and brown patch at base of costa; the basal half with traces of highly waved lines, three at middle having a ferruginous patch on them at costa, then acutely angled on median nervure, where they meet some of the strong dentitions of the postmedial lines; a ferruginous patch on costa towards apex, crossed by the lines of outer area, which are very oblique from costa to vein 5, then become ferruginous and strongly dentate inwards. Hindwing white.

Habitat.—Sikhim. *Exp.* 36 mm.

P. 391. Under **Chloroclystis**, insert (syns.) *Sesquiptera*, Warr., Nov. Zool., iii, p. 126 (1896); *Gymnopera*, Warr., Nov. Zool., iii, p. 126 (1896); *Ætheolepis*, Warr., Nov. Zool., iii, p. 124 (1896); *Syncosmia*, Warr., Nov. Zool., iv, p. 70 (1897); and *Eriopethex*, Warr., Nov. Zool., iii, p. 390 (1896).

3756*a*. CHLOROCLYSTIS NIGROVIRIDATA, Warr., Nov. Zool., iii, p. 124.

♂. Head and thorax green with some black markings; abdomen fuscous, the anal tuft rufous. Forewing bright green, a maculate subbasal black band dilated on costa; a medial black band defined by white lines, expanding below vein 2 and conjoined to the postmedial band, which is dentate on inner and outer sides beyond cell, and below vein 4 is incurved and obsolescent; cilia rufous, intersected with fuscous. Hindwing whitish, tinged with fuscous and rufous; cilia rufous.

Habitat.—Khásis. *Exp.* 26 mm.

(*Syncosmia.*) Hindwing of male with a spatulate valve folded over on upper surface of wing at anal angle.

3762*a*. *Chloroclystis patinata*, Warr., Nov. Zool., iv, p. 71.

♂. Head, thorax, and abdomen green (fading to ochreous) and black. Forewing green, with numerous rather indistinct waved black lines, except on outer area; an antemedial black band; a fine marginal line, cilia pale, mixed with black. Hindwing ochreous-white.

Habitat.—Khásis. *Exp.* 20 mm.

3763*b*. CHLOROCLYSTIS GRISEORUFA, n. sp. (Pl. A., fig. 6.)

♀. Dark bluish-grey; head and collar rufous. Forewing with the basal half of costal area suffused with bright chestnut-red; an indistinct antemedial dark line acutely angled outwards on subcostal and medial nervures; a medial black line defined by white on outer side and angled outwards on vein 4; a faint submarginal dark shade. Hindwing irrorated with some white and black scales on the veins; a medial line angled outwards on vein 4, the area before it darker. Underside streaked with white, especially beyond the medial line.

Habitat.—Sikhim, 1,800 feet (Dudgeon). *Exp.* 16 mm. *Type.*—In British Museum.

3763*c*. CHLOROCLYSTIS CORONATA, Hübn Samml. eur. Schmett. (figs. 372-373). *Æikeolepis papillosa*, Warr., Nov. Zool., iii, p. 424, and iv, p. 68.

♂. Yellow-green; patagia and base and extremity of abdomen marked with black. Forewing with numerous waved lines, the antemedial, postmedial, and a submarginal line with a series of black points on it; two black marks above inner margin before the antemedial line; the postmedial line more or less strongly defined by brown on inner side from costa to vein 4 and angled on veins 6 and 4; cilia chequered green and fuscous. Hindwing pale brown. ♀. With the outer area green; numerous indistinct waved lines, the postmedial and submarginal most prominent; cilia chequered.

Habitat.—Europe; Sikhim; Khásis. *Exp.* 20-26 mm.

3770*a*. CHLOROCLYSTIS LEUCOPYGATA, Warr., Nov. Zool., iii, p. 389.

♂. Dark brown with a reddish tinge and suffused with fuscous; anal tuft whitish. Forewing with numerous indistinct pale waved lines, two forming an obscure antemedial band; the postmedial pale waved lines distinct, angled inwards below costa and outwards on veins 5 and 4, then inwardly oblique; a black discocellular spot; submarginal blackish blotches on costa and above middle; the indistinct submarginal waved line with series of white specks. Hindwing with numerous indistinct waved lines, the postmedial rather more prominent and angled on vein 4; a submarginal series of white points. Underside grey with patches of fuscous suffusion; prominent black cell spots and a very highly and irregularly dentate strong postmedial line.

Habitat.—Khásis. *Exp.* 30 mm.

(*Eriopithex.*) Antennæ of male clothed above with thick short hair directed towards the base.

3771*a*. Chloroclystis lanaris, Warr., Nov. Zool., iii, p. 391.

Pale brown irrorated and suffused with fuscous; wings with numerous indistinct waved lines. Forewing with rather more promiment antemedial, postmedial and submarginal lines. Hindwing with discocellular speck and prominent medial waved line, dentate inwards beyond the cell.

Habitat.—Khásis. *Exp.* 16 mm.

Hindwing of male with the outer area above thickened by closely set scales.

a. (*Gymnopera.*) Hindwing with the discocellulars angled, vein 5 from below the angle.

3772*a*. Chloroclystis rubroviridis, Warr., Nov. Zool., iii, p. 127.

♂. Pale green. Forewing with numerons waved white lines occupying the greater part of wing, the ante-and postmedial being strongest; some dark marks on inner margin before middle, and some dark points on outer edge of antemedial line; a pale red mark beyond discocellulars, followed by a fuscous mark. Hindwing pale bluish-green, the thickened outer area greyish.

Habitat.—Khásis. *Exp.* 22 mm.

b. (*Sesquiptera.*) Hindwing with the discocellulars oblique, vein 5 from middle.

3772*b*. Chloroclystis inæquata, Warr., Nov. Zool., iii, p. 126.

♂. Pale green. Forewing with traces of numerous waved lines; some black marks on inner margin before the middle; the ante-and postmedial lines black, angled, and the latter produced to an acute point below costa, the area between them suffused with fuscous; a marginal series of black striæ. Hindwing greyish, the outer area dark brown.

Habitat.—Khásis. *Exp.* 18 mm.

3781. Eupithecia rajata, insert. (syn.) *Tephroclystia tenuisquama*, Warr., Nov. Zool., iii, p. 317.

3784*a*. Eupithecia nigrilinea, Warr., Nov. Zool., iii, p. 317.

♀. Differs from *E. latimedia* in having no rufous tinge. Forewing with the postmedial line slightly excurved beyond the discocellular spot from costa to vein 2. Hindwing with the postmedial line less oblique from beyond middle of costa to above anal angle.

Habitat.—Kasauli. *Exp.* 22 mm.

3795*b*. Eupithecia biviridata, Warr., Nov. Zool., iii, p. 125.

Differs from *E. chlorophora* in the base of forewing being green to the antemedial line ; the outer area green without any dark patches ; the outer area of hindwing green.

Habitat.—Khásis. *Exp.* 16 mm.

3795*c*. Eupithecia semifusca, Warr., Nov. Zool., iii, p. 123.

Head, thorax and abdomen fuscous. Forewing pale brown suffused with fuscous to the postmedial line; subbasal, antemedial, medial and postmedial black lines, the last defined by white on outer side, indented beyond cell and incurved below vein 2 ; outer area pale reddish-brown with traces of several waved lines ; an irregular submarginal fuscous patch from costa to vein 5, and some fuscous suffusion on margin. Hindwing yellowish-white with a rufous tinge ; traces of three medial lines more distinct on underside ; outer area fuscous.

Habitat.—Sikhim; Khásis. *Exp.* 20 mm.

3799*a*. Trichopterygia ustimargo, Warr., Nov. Zool., iii, p. 121.

♀. Head ochreous, palpi black. Forewing pale green ; the inner area suffused with black ; the disk with purple and pale red scales : traces of waved antemedial, medial and postmedial lines, the last with an oblique black striga on it below costa, then a series of black points ; a marginal series of fuscous points. Hindwing yellowish-white with fine dark marginal line.

Habitat.—Khásis. *Exp.* 34 mm.

3799*b*. Trichopterygia nigrosculpta, Warr., Nov. Zool., iv, p. 68.

White ; palpi black at sides ; patagia tipped with black ; abdomen with black dorsal line. Forewing with slight reddish tinge ; a curved black subbasal line ; antemedial and medial lines highly excurved in cell and incurved below it, with a black costal striga between them ; a black discocellular lunule ; a double postmedial line excurved below costa and incurved below lower angle of cell, with a costal striga and series of black points on the veins beyond it; a double submarginal line excurved and interrupted below costa and at middle and incurved below vein 3, and with some black marks beyond it; a series of short streaks on the veins before the margin; a marginal series of pairs of points.

Habitat.—Sikhim. *Exp.* 44 mm.

Genus HYPOCOMETA.

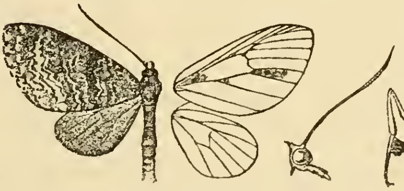
Hypocometa, Warr., Nov. Zool., iii, p. 119 (1896).

Differs from *Phthonoloba* in the hindwing having vein 2 absent; hind tibiæ with the spurs absent, a large tuft of hair on lower side of first joint of tarsus and no tuft from femero-tibial joint.

3806*a*. HYPOCOMETA CLAUDA., Warr., Nov. Zool., iii, p. 119.

♂. Differs from *P. decussata* in the forewing having the black markings rather more extensive; a series of small V-shaped marks on the margin.

Habitat.—Khásis. *Exp.* 42 mm.



Hypocometa clauda, ♂ ½.

3812*b*. SAURIS BICOLOR, Warr., Nov. Zool., iii, p. 120.

♂. Yellow-green; antennæ and abdomen ochreous. Forewing with numerous pale waved lines almost forming bands and occupying the greater part of wing, the most distinct being a medial band from costa to middle of discocellulars and a dentate submarginal line; the area below the cell and the disk up to vein 5 pale brown with a vinous tinge. Hindwing brownish; the medial lobe fuscous, the cilia rufous.

Habitat.—Khásis. *Exp.* 40 mm.

3815*a*. SAURIS NIGRIFUSALIS, Warr., Nov. Zool., iii, p. 120.

Hind tibiæ and abdomen of male without tufts of hair. Green. Forewing with black basal point and waved black subbasal line excurved below costa, and with small patches of purplish-fuscous suffusion on its outer edge; numerous indistinct waved lines from middle to outer margin, the whole of this area being suffused with purplish-fuscous, except a large apical patch and some green between the waved submarginal lines. Hindwing brownish-fuscous.

Habitat.—Khásis. *Exp.* 38 mm.

3829. HYDRELIA PLUMBEOLINEATA, insert (syn.) *Agnibesa venusta*, Warr., Nov. Zool., iv, p. 65.

A form with the fulvous much more extensive on the costal area of forewing, the outer area fuscous-brown, leaving a white patch on costa towards apex and the inner area white from outer margin above outer angle to inner margin near base.

3836. ASTHENA PLURILINEARIA, insert (syn.) *Laciniodes denigrata*, Warr., Nov. Zool., iii, p. 316.

3837*a*. ASTHENA LIVIDA, Warr., Nov. Zool., iii, p. 116.

♂. Dark purplish grey-brown; frons dark chocolate. Forewing crossed by seven waved chocolate lines, the two outer more crenulate; a discocellular black speck. Hindwing crossed by four lines, the first nearly straight, the second sinuous; the two outer crenulate; both wings with fine marginal crenulate black line. Underside greyer, with distinct elongate discal points to each wing.

Habitat.—Khásis. *Exp.* 28 mm.

P. 419. Under **Cambogia**, insert (syn.) *Onagrodes*, Warr., Nov. Zool., iii, p. 125.

(*Onagrodes.*) Forewing with the apex rounded; male with circular patches of ochreous scales on underside of forewing at base of vein 2 and on upperside of hindwing below middle of costa; veins 3 and 4 well separated at origin.

3843*a*. CAMBOGIA OBSCURATA, Warr., Nov. Zool., iii, p. 125.

♂. Dark red-brown, Forewing with traces of ochreous ante- and postmedial lines. Hindwing slightly redder, with the ochreous patch prominent.

Habitat.—Khásis. *Exp.* 20 mm.

P. 426. Under **Craspedia**, insert (syn.) *Symmacra*, Warr., Nov. Zool., iii, p. 116 (1896).

3861. CRASPEDIA WALKERI, insert (syns.) *Craspedia hyphenophora*, Warr., Nov. Zool., iii, p. 310; *Caspedia nigridentata*, Warr., Nov. Zool., iii, p. 310.

3862. CRASPEDIA FLUIDARIA, insert (syn.) *Ptychopoda inangulata*, Warr., Nov. Zool., iii, p. 314.

3880. CRASPEDIA ASPILATARIA, insert (syn.) *Ptychopoda quinquestriata*, Warr., Nov. Zool., iii, p. 314.

3883. Craspedia remotata, insert (syns.) *Craspedia straminea*, Warr., Nov. Zool., iii, p. 310; *Craspedia subcarnea*, Warr., Nov. Zool., iii, p. 311; *Craspedia pulverosa*, Warr., Nov. Zool., iii, p. 311; *Ptychopoda albiflava*, Warr., Nov. Zool., iii, p. 313; *Ptychopoda complanata*, Warr., Nov. Zool., iii, p. 313; *Ptychopoda consimilata*, Warr., Nov. Zool., iii, p. 313; *Craspedia aggravata*, Warr., Nov. Zool., iv, p. 50.

3883*a*. Craspedia unilineata, Warr., Nov. Zool., iii, p. 315.

♀. Differs from *remotata* in the antemedial line of forewing being more erect; the second line medial, diffused, and enclosing a whitish discocellular speck; the submarginal line bent inwards, and with dark mark on it below vein 6, then almost straight. Hindwing with the antemedial line less oblique; the second line fine, evenly curved and medial.

Habitat—Khásis. *Exp.* 22 mm.

(*Symmacra.*) Hind legs of male fully developed, with fold containing a large tuft of hair, a terminal pair of spurs.

3887*a*. Craspedia regularis, Warr., Nov. Zool., iv, p. 116.

♂. Reddish-brown, suffused with fuscous; frons dark-brown; vertex of head and shaft of antennæ white. Forewing with the costal area darker fuscous; sinuous fuscous ante- and postmedial lines; a discocellular black point; a crenulate submarginal line and marginal series of pale points. Hindwing with dark edged white discoidal point; a sinuous medial and crenulate postmedial line; a marginal series of pale points.

Habitat.—Khásis. *Exp.* 24 mm.

3889. Craspedia defamataria, insert (syn.) *Craspedia mollis*, Warr., Nov. Zool., iii, p. 373.

3894. Acidalia chotaria, insert (syns.) *Ptychopoda grisescens*, Warr., Nov. Zool., iii, 313; *Arhostia persimilis*, Warr., Nov. Zool., iii, p. 109; *Janarda ruptifascia*, Warr., Nov. Zool., iii, p. 112.

3895*a*. Acidalia maculata, Warr., Nov. Zool., iii, p. 311.

♂. Pale dull yellow-brown; frons black; abdomen marked with black. Forewing with an antemedial band represented by some black scales on costa and others below the cell; medial black marks on costa, at lower angle of cell, and on inner margin; postmedial spots on costa and inner margin and a submarginal irregular series of small spots, the spot below vein 6 with a smaller one beyond it; a marginal series of specks. Hindwing with subbasal and medial black bands, the latter dentate outwards below cell; a postmedial band of irregularly dentate marks and irregular submarginal and marginal series of small spots. (*Legs broken.*)

Habitat.—Khásis. *Exp.* 16 mm.

3900. ACIDALIA ACTIOSARIA, insert (syns.) *Ptychopoda obliquilinea*, Warr., Nov. Zool., iii, p. 115; and *Ptychopoda semisericea*, Warr., Nov. Zool., iv, p. 60.

3900*a*. ACIDALIA SEMILINEA, Warr., Nov. Zool., iii, p. 314.

Differs from *A. actiosaria* in being browner. Forewing with the medial line obsolescent; the postmedial reduced to a prominent regularly curved series of black specks, with three dentate dark marks beyond them at costa; a marginal series of specks. Hindwing with the antemedial line very strong and black; the postmedial reduced to a series of black specks; a marginal series of specks.

Habitat.—Khásis. *Exp.* 20 mm.

3901. ACIDALIA LEUCOZONA, insert (syn.) *Ptychopoda luteata*, Warr., Nov. Zool., iii, p. 118, Khásis.

3906. ACIDALIA INSUAVIS, insert (syn.) *Eois costiguttata*, Warr., Nov. Zool., iii, p. 311.

3907*a*. ACIDALIA PTYONOPODA, insert (syn.) *Ptychopoda rubellata*, Warr., Nov. Zool., iii, p. 115, Khásis.

3912*a*. ACIDALIA RUBRIDENTATA, Warr., Nov. Zool., iii, p. 112.

♂. Hind legs wanting; forewing with the apex acute. Purplish-pink; vertex of head white; antennæ ochreous; anal tuft yellow. Forewing with the costa purple; oblique sinuous antemedial and medial purplish lines; a postmedial sinuous line excurved to near margin at middle; a waved purplish line just inside the margin; the margin and cilia golden-yellow. Hindwing with oblique medial and curved postmedial lines; a waved line just inside the margin, the margin and cilia golden-yellow.

Habitat.—Khásis. *Exp.* 18 mm.

3913. ACIDALIA PERMUTANS, insert (syn.) *Eois flavisinuata*, Warr., Nov. Zool., iii, p. 111. Khásis.

3918*a*. CHRYSOCRASPEDA PERPICTA, Warr., Nov. Zool., iii, p. 109.

♂. Head, thorax, and abdomen pinkish-white, suffused in parts with red. Forewing yellow, irrorated with red; the costal and inner areas suffused with pinkish-white: a white discocellular speck on a reddish patch; traces of a red submarginal line incurved to costa. Hindwing yellow; the basal and costal areas strongly irrorated with red; a prominent white red-edged discoidal spot; an obscure red medial band on inner area; a purple blotch on inner area before anal angle; the margin suffused with purplish-white; a purple marginal line; cilia yellow.

Habitat.—Khásis. *Exp.* 28 mm.

3919*a*. CHRYSOCRASPEDA SANGUINEA, Warr., Nov. Zool., iii, p. 110.

♂. Bright pink; thorax and abdomen suffused in parts with purple. Forewing with purple suffusion on costal and apical areas and outer margin; a dark discocellular spot conjoined to the purplish costal area; cilia golden-yellow. Hindwing with white discocellular spot; the margin purple; the cilia golden-yellow.

Habitat.—Khásis. *Exp.* 24 mm.

3923*b*. CHRYSOCRASPEDA SUBANGULATA, Warr., Nov. Zool., iii., p. 110.

♂. Ochreous, irrorated with pink and suffused with purplish. Forewing with obscure dark antemedial line very acutely angled below costa; a black discocellular point; a sinuous postmedial line excurved below costa and ending near outer angle; the margin purple angle outwards into the golden-yellow cilia at middle. Hindwing with subbasal purplish line; a white discocellular point; a purplish sinuous postmedial line; the margin purple; cilia golden-yellow.

Habitat.—Khásis. *Exp.* 24 mm.

P. 445. Under **Ephyra,** insert (syn.) *Anisephyra*, Warr., Nov. Zool., iii, p. 369 (1896).

3925*a*. EPHYRA RUFARIA, Warr., Nov. Zool., iii, p. 370.

Head and thorax reddish-brown; abdomen paler. Forewing pale brown, suffused with red and mottled with fuscous; obscure interrupted fuscous ante- and postmedial lines angle inwards and stronger at costa. Hindwing paler; inner area suffused with reddish, the outer area with fuscous; an obscure fuscous postmedial line. Some specimens are much more ochreous than others.

Habitat.—Jubbulpore; Ajmere. *Exp.* 24 mm.

P. 446. Under **Anisodes**, insert (syn.) *Phryssosceles*, Warr., Nov. Zool., iii, p. 114 (1896).

3926*a*. ANISODES MEDIUSTA, Warr., Nov. Zool., iii, p. 114.

♂. Differs from *A. obrinaria* in being much yellower; both wings with a diffused sinuous purplish-fuscous medial line.

Habitat.—Khásis. *Exp.* 34 mm.

(*Phryssosceles.*) Hind femora of male with large fringe of scales pink at extremity, above the tibia fully developed and without the medial spurs, frons with deep groove.

3928*a*. ANISODES ARGYROMMA, Warr., Nov. Zool., iii, p. 114.

♂. Yellow, irrorated with pink. Forewing with the costa fuscous; an indistinct waved antemedial line, with two black specks on it; dentate, medialand postmedial lines, the latter with a series of black specks on it; a marginal series of specks. Hindwing with large silvery-white cell-spot, edged by a fine black line; traces of a subbasal line; dentate, medial and postmedial lines; a marginal series of specks.

Habitat.—Khásis. *Exp.* 44 mm.

3929. ANISODES INTERPULSATA, insert (syn.) *Perixera flavispila*, Warr., Nov. Zool., iii, p. 312.

3932. ANISODES PALLIDA, insert (syns.) *Perixera rufidorsata*, Warr., Nov. Zool., iii, p. 312; and var. *perscripta*, Warr., Nov. Zool., iii, p. 376.

3936. ANISODES OBSTATARIA, insert (syn.) *Perixera imbuta*, Warr., Nov. Zool., iv, p. 58.

3939. ANISODES MONETARIA, insert (syn.) *Platisodes jocosa*, Warr., Nov. Zool., iii, p. 114.

A form with very prominent small black spots on all the lines; the black ring of annulus of hindwing broad the centre small. (Hindlegs wanting).

3944. ORGANOPODA CARNEARIA, insert (syn.) *Discoglypha variostigma*, Warr., Nov. Zool., iii, p. 311.

P. 452. Under **Erythrolophus**, insert (syn.) *Discoglypha*, Warr., Nov. Zool., iii, p. 110 (1896) for Section I. B.

3950*a*. ERYTHROLOPHUS AUREIFLORIS, Warr., Nov. Zool., iii, p. 111.

♂. Deep purplish-red; vertex of head white. Forewing with antemedial, postmedial, and submarginal waved fuscous lines, the second angled on vein 4, then incurved; a black discocellular point; a marginal series of small white points. Hindwing with large yellowish-white discocellular spot, indented on both sides at middle and emitting a small spatulate process on underside ; indistinct medial and postmedial dentate fuscous line ; a marginal series of minute white specks.

Habitat.—Khásis. *Exp.* 30 mm.

3950*b*. Erythrolophus inflammatus, Warr., Nov. Zool., iii, p. 111.

♂. Head deep pink ; the vertex white ; thorax, abdomen, and wings red-brown. Forewing with fiery-red streaks in, beyond, and below the cell ; the costal area fuscous ; an oblique subbasal line ; a discocellular point ; medial and postmedial waved lines, the former angled at vein 4, then incurved, the latter dentate inwards below vein 2. Hindwing with pure white black-edged triangular cell-spot ; medial and postmedial dark lines, the former angled at middle, the latter curved and dentate ; red streaks in cell and towards outer margin.

Habitat.—Khásis. *Exp.* 30 mm.

3950*c*. Erythrolophus sanguinatus, Warr., Nov. Zool., iii, p. 113.

♂. Orange, suffused in parts with red ; head dark brown. Forewing with the costa dark brown ; antemedial, medial, and postmedial waved red lines ; a black cell-spot ; the red suffusion chiefly between end of cell and outer angle ; some submarginal patches of red, with a black spot on one above middle. Hindwing with the red suffusion occupying most of wing ; a black cell-spot ; an indistinct irregularly dentate postmedial line ; both wings with marginal series of black specks.

Habitat.—Khásis. *Exp.* 30 mm.

3953. Erythrolophus pallivittatus, insert (syn.) *Craspediopsis inæquata*, Warr., Nov. Zool., iii, p. 109.

3963. Rhodostrophia herbicolens, insert (syn.) *Rhodostrophia muricolor*, Warr., Nov. Zool., iv, p. 61.

3971. Timandra responsaria, insert (syn.) *Timandra strigulata*, Warr., Nov. Zool., iii, p. 116 ; *Timandra obsoleta*, Warr., Nov. Zool., iv, p. 63 ; and *Timandra ruptilinea*, Warr., Nov. Zool., iv, p. 64.

P. 463. Under **Somatina**, insert (syn.) *Orthoserica*, Warr., Nov. Zool., iii, p. 113 (1896).

(*Orthoserica.*) Antennæ of male bipectinate; hind femora with large tufts of long hair from extremity; the tibiæ shortened and without spurs ; the tarsus dilated and fringed with hair.

3988*a*. SOMATINA RUFIGRISEA, Warr., Nov. Zool., iii, p. 113.

♂. Bright red-brown; head blackish; collar grey; abdomen with grey segmental lines. Forewing with the costal area grey to beyond middle, emitting an antemedial blotch nearly met by a blotch on inner margin and an irregular medial blotch; a large grey blotch on costa before apex; both wings with dentate postmedial line, oblique on forewing, curved on hindwing; a sinuous submarginal line excurved at middle and with grey spots beyond it, continuous towards outer and anal angles. Hindwing with the base grey; a black discocellular point.

Habitat.—Khásis. *Exp.* 40 mm.

4006*a*. PSEUDOTERPNA SUBVIRIDIS, Warr., Nov. Zool., iii, p. 308.

♂. White, mostly suffused with rather grey-green. Forewing with highly crenulate ante- and postmedial lines, the area between them rather whiter, and with a large discocellular green spot and darker costal patch beyond the postmedial line; both wings with rather irregularly dentate white submarginal line, and some red irroration on inner margin, and more distinct spot at anal angle of hindwing. Underside white, suffused with yellow towards base; forewing with purplish discoidal spot; both wings with broad deep purple submarginal band, running out to the margin above middle and outer angle of forewing, below apex, and above middle and analangle of hindwing.

Habitat.—Khásis. *Exp.* 48 mm.

4015*a*. PSEUDOTERPNA FUNEBROSA, Warr., Nov. Zool., iii, p. 308.

♂. Differs from *P. apicalis* in the colour being fuscous-brown, very slightly tinged with green, and not variegated with green and refous; the head and subbasal band of forewing greyer-green, the white patch not extending up to apex; the series of submarginal white specks more complete. Underside white instead of orange; only the apical white marginal patch. Hindwing without discocellular spot, and with the white on margin only broken at middle.

Habitat.—Khásis. *Exp.* 50 mm.

P. 482. Under **Chlorodontopera**, insert (syn.) *Camptolophia*, Warr., Nov. Zool., iii., p. 102 (1896); *Chloromianta*, Warr., Nov. Zool., iii, p. 104, for Sect. ii B., and *Rhomborista*, Warr., Nov. Zool., iv, p. 45 (1897).

4034*a*. CHLORODONTOPERA MARMORATA, Warr., Nov. Zool., iii., p. 102. (Pl. A., fig. 16.)

♂. Frons pink ; antennæ ochreous ; vertex of head green ; thorax green with a patch of purplish-rufous and ochreous on vertex; abdomen greenish-ochreous with the dorsal tufts reddish. Forewing with the outer margin slightly crenulate and produced to small points at veins 4 and 6 ; dark green thickly irrorated with yellowish-white ; the costa yellowish ; a crenulate whitish antemedial line and sinuous postmedial line ; a black speck on discocellulars ; the greater part of outer area yellowish-white ; some dark striæ and pale orange streaks below apex, and some dark striæ above outer angle ; an ochreous and red spot on inner margin at postmedial line ; the veins whitish. Hindwing dark green to the sinuous whitish postmedial line ; the discocellulars and veins beyond the cell whitish ; the inner margin ochreous and red, with two white striæ before middle ; the outer area variegated with purplish, red, green, black and yellow, and with fine dark striæ ; a dentate whitish line beyond the postmedial line running out to a long point filled in with black below vein 3, and with green between it and postmedial line below vein 4 ; blackish patches near apex and a large yellowish patch on outer medial area. Underside white ; two black submarginal patches on forewing, and a broad somewhat irregular postmedial black band on hindwing.

Habitat.—Khásis. *Exp.* 42 mm.

4040*a*. CHLORODONTOPERA MEGASPILARIA, Gruen., Phal., 1, p. 371; *Comibæna uniplaga*, Wlk., xxii, 578 ; *Rhomborista semipurpurea*, Warr., Nov. Zool., iv, p. 45.

Differs from *C. pannosa* in the blotch at outer angle of forewing being very much larger, extending up to vein 5, and without white centre. The form *semipurpurea* from Chittagong has the blotch extending up to the costa, leaving an apical green patch; the postmedial rufous line of hindwing prominent.

Habitat.—Chittagong ; Shevaroys ; Borneo ; Java. *Exp.* 30-38 mm.

4041*a*. CHLORODONTOPERA FERRUGINATA., Warr., Nov. Zool., iii, p. 104.

♂. Yellow-green, frons red ; vertex of head and antennæ white ; abdomen with the dorsal tufts pink. Forewing with the costa white ; an indistinct waved rufous antemedial band ; a large purplish submarginal blotch from vein 5 to inner margin, with yellowish striæ above it and on its edges, which are irregular, and a black patch on inner margin ; cilia yellowish. Hindwing with rufous patch on inner margin before middle ; a blackish apical patch crossed by a rufous line ; a yellowish postmedial band with waved rufous edges and rufous striæ on it ; cilia yellowish.

Habitat.—Khásis. *Exp.* 36 mm.

4046. AGATHIA BEATA, insert (syn.) *Agathia subdeleta*, Warr., Nov. Zool., iii, p. 102.

A variety with the dark markings very much reduced.

P. 497. Under **Euchloris** insert (syn.) *Chlorochromodes*, Warr., Nov. Zool., iii, p. 103 (1896), and *Comostolodes*, Warr., Nov. Zool., iii, p. 308 (1896), for Sect. i. C.

4078*a*. EUCHLORIS CONVALLATA, Warr., Nov. Zool., iii, p. 108.

♀. White suffused with pale rufous (? faded from green); frons rufous; vertex of head white. Forewing with oblique rufous antemedial line slightly angled below cell; a discocellular white-centred lunule; an oblique rufous postmedial line with white outer edge. Hindwing with white-centred discocellular rufous lunule ; an oblique medial rufous line with white outer edge.

Habitat.—Khásis. *Exp.* 38 mm.

4081*a*. EUCHLORIS TENERA, Warr., Nov. Zool., iii, p. 103.

Hindwing with veins 6-7 stalked. Yellow-green. Forewing with the costa white ; an oblique antemedial white line from cell to inner margin ; a postmedial series of white specks on the veins ; both wings with rufous discoidal point; a fine black marginal line and the cilia white.

Habitat.—Khásis. *Exp.* ♂ 26, ♀ 30 mm.

4083. EUCHLORIS DISPANSA, insert (syn.) *Comostolodes albicatena*, Warr., Nov. Zool., iii, p. 309.

4086. EUCROSTES SUBTILIARIA, insert. (syn.) *Comostola mundata.* Warr., Nov. Zool., iii, p. 105.

4086*a*. EUCROSTES ALBIFIMBRIA, Warr., Nov. Zool., iii, p. 105.

♂. Forewing with the discocellulars straight, veins 3, 4, and 11 from cell. Yellow-green ; frons rufous ; vertex of head and shaft of antennæ white. Forewing with the costa rufous ; pale crenulate ante- and postmedial lines ; a purplish-brown discocellular spot and lunulate marginal line ; cilia yellow. Hindwing with purplish-brown discocellular bar and lunulate marginal line ; a pale crenulate postmedial line ; cilia yellow.

Habitat.—Khásis. *Exp.* 20 mm.

4100. Eucrostes disparata, insert (syn.) *Hemithea punctifimbria*, Warr., Nov. Zool., iii, p. 366.

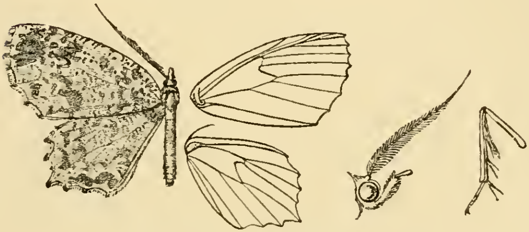
Genus Helicopage.

Helicopage, Warr., Nov. Zool., iii, p. 106 (1896).

Type.—*H. hirundinalis* (Warr.).

Range.—North-east India.

Palpi with the second joint upturned to above vertex of head, and fringed with hair on both sides, the third long, porrect and spatulate at extremity ; frons smooth ; antennæ bipectinate, the apex simple ; hind tibiæ of male with fold and tuft, two pairs of spurs present ; abdomen without dorsal tufts. Forewing with the outer margin slightly crenulate ; 7 from upper angle ; 8, 9, 10, stalked. Hindwing with the outer margin highly crenulate and produced to an angle at vein 4 ; veins 3, 4, 6, and 7, from angles of cell ; male with a fovea at base between costal and subcostal nervures ; the retinaculum a long corneous bar curled round at extremity.



Helicopage hirundinalis, ♂ $\frac{1}{1}$.

4104*a*. Helicopage hirundinalis, Warr., Nov. Zool., iii, p. 106.

♂. Bright emerald-green irrorated with pale fuscous ; palpi and antennæ pale ochreous. Forewing with fuscous patches near base of costa and inner margin, an antemedial series, double in cell ; a spot at upper angle of cell ; three claviform black marks beyond the cell, with ochreous on their outer edges on a fuscous patch ; two obscure postmedial series of lunulate marks ; a large subapical patch and a spot above vein 2. Hindwing with basal patch ; a spot at upper angle of cell ; medial spots on costa and inner margin ; obscure postmedial and submarginal series of spots ending in an irregular patch near anal angle.

Habitat.—Sikhim ; Khásis. *Exp.* 46 mm.

4114. THALASSODES OPALARIA, insert (syn.) *Iodis inumbrata*, Warr., Nov. Zool., iii, p. 107.

4115. THALASSODES GRISCOVIRIDIS, insert (syns.) *Iodis delicatula*, Warr., Nov. Zool., iii, p. 309 ; *Iodis iridescens*, Warr., Nov. Zool., iii, p. 108 ; *Iodis cœruleata*, Warr., Nov. Zool., iii. p. 107.

4115*b*. THALASSODES ANNULIFERA, Warr., Nov. Zool., iii, p. 107.

♂. Greenish-grey ; frons rufous ; vertex of head white. Forewing with the costa ochreous ; a waved white antemedial line ; a diamond-shaped white mark with green centre at end of cell ; a dentate white postmedial line bent outwards between veins 3 and 4. Hindwing with waved white antemedial line ; discocellular annulus ; postmedial dentate white line angled outwards at veins 3 and 4. Underside white.

Habitat.—Khásis. *Exp.* 22 mm.

4120*a*. THALASSODES ANOMALA, Warr., Nov. Zool., iii, p. 106. (Pl. A, fig. 11.)

Hind tibiæ of male with one pair of spurs, dilate and with tuft of hair ; antennæ ciliated. Blue-green ; frons rufous ; vertex of head white ; abdomen white. Forewing with the costa white ; a curved antemedial white line ; a nearly straight postmedial line. Hindwing with slightly sinuous medial white line ; cilia white at tips.

Habitat.—Hunza ; Masuri ; Kulu. *Exp.* ♂ 32, ♀ 34 mm.

4127. THALASSODES OBNUPTA, insert (syn.) *Acrortha flexicosta*, Warr., Nov. Zool., iii, p. 361.

4127*a*. THALASSODES CONTRACTA, Warr., Nov. Zool., iii, p. 107.

♂. Forewing with vein 11 given off from 6, 7, 8, 9, 10 and anastomosing with 12 ; 3-4 from cell. Yellow-green ; vertex of head and shaft of antennæ white. Forewing with waved olive-yellow ante- and postmedial lines. Hindwing with discocellular spot and waved olive medial line ; underside whitish, with fuscous postmedial shade deepest near inner margin of forewing and costa of hindwing.

Habitat.—Khásis. *Exp.* 20 mm.

4130*a*. THALASSODES DISCOLOR, Warr., Nov. Zool., iii, p. 108.

♂. Forewing with the apex strongly produced and falcate, the outer margin excised from apex to vein 4, where it is produced to a point ; the margin of both wings slightly crenulate. Head, thorax and abdomen greenish-ochreous; vertex of head white; legs banded with brown; wings dull greenish suffused with opalescent-purple. Forewing with traces of sinuous antemedial line; an ochreous-white postmedial patch between veins 1 and 3; cilia white at the excision. Hindwing with broad yellowish-white band of disintegrated patches irrorated with fuscous, with a much-interrupted waved line beyond it, and some of the patches forming an ocellus below costa. Underside with the whitish patches more prominent.

Habitat.—Khasis. *Exp.* 58 mm.

P. 514. Under **Thalera,** insert (syn.) *Chloromma,* Warr., Nov. Zool., iii., p. 104 (1896).

(*Chloromma.*) Hindwing with veins 3, 4 and 6, 7 shortly stalked, the margin produced to a long point at vein 4.

4138*a*. THALERA MIMICA, Warr., Nov. Zool., iii, p. 105.

♂. Dull-green; frons pale brown, vertex of head white. Forewing with indistinct sinuous antemedial line; a black discocellular spot; a crenulate blackish postmedial line. Hindwing with diffused black postmedial blotch and crenulate black postmedial line, bent outwards at veins 3 and 4.

Habitat.—Khásis. *Exp.* 32 mm.

4139*a*. THALERA RECTILINEA, Warr., Nov. Zool., iii, p. 309.

♂. Hindwing with veins 3-4 stalked. Blue-green; frons rufous; vertex of head white; abdomen white, with white-spotted pink dorsal band. Forewing with the costa white, speckled with rufous; a fine pale oblique antemedial line slightly bent below cell, and with crimson speck on inner margin; both wings with oblique postmedial line slightly bent below vein 2 of forewing, and with crimson spot on its inner side at inner margin, bent inwards to costa of forewing; both wings with maculate white marginal line defined by crimson on inner side; the cilia pinkish.

Habitat.—Khásis. *Exp.* 30 mm.

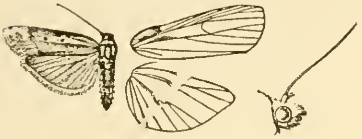
PYRALIDÆ.

Vol. iv, p. 4. Genus STENACHROIA.

Stenachroia, Hmpsn, Rom. Mem., viii, ined.

Type—S. elongella (Hampson).

Range.—Assam.



Stenachroia elongella, ♂ $\frac{1}{1}$.

Palpi of male small, upturned and tufted with hair; maxillary palpi minute; proboscis well developed; frontal tuft large, truncate, and hollowed out below; antennæ short, simple, the basal joint tufted with hair. Forewing long and narrow; the costa nearly straight to near apex, which is rounded; the outer margin short; the cell rather long; vein 2 from half its length; 3 from angle; 4-5 on a long stalk; 6 from upper angle; 7-8 stalked from before angle; 9 absent; 10-11 from cell; male with a glandular swelling at base of costa below; a fringe of upturned scales in middle of cell above median nervure. Hindwing with the cell open; veins 3 and 5 stalked from 2; 4 absent; 6-7 stalked; ; 7 anastomosing with 8.

4142*a*. STENACHROIA ELONGELLA, Hmpsn., Rom. Mem., viii, ined., pl. 54, f. 20.

♂. Head, thorax, and abdomen yellowish-white. Forewing yellowish-white irrorated with a few black scales; a diffused whitish streak in cell; a point of black scales in middle of cell and another on discocellulars; a faint oblique fuscous postmedial band; a marginal series of black specks. Hindwing semi-hyaline whitish, the veins and a marginal line fuscous.

Habitat.—Khásis. *Exp.* 28 mm.

DOLOESSA (Zell., Isis., 1848, p. 860), has precedence over *Thagora.*

4143. DOLOESSA CASTANELLA. Insert (syn.) *Carcinoptera ochrociliella*, Rag., Rom. Mem., vii, pl. viii, f. 24.

4144. Insert DOLOESSA VIRIDIS (Zell., Isis, 1848), p. 860, which has priority; ♂ without streaks of the black scales.

4144*a*. DOLOESSA CONSTELLATA, Hmpsn., Rom. Mem., viii, ined., pl. 54, f. 12.

♀. Head ochreous-white; thorax green; abdomen white. Forewings bright apple-green; an antemedial fine dark line angled inwards in cell and on vein 1 and outwards below cell; a cluster of four points of raised white scales on fuscous spots in end of cell in the form of an oblique letter V; the postmedial line fine, dark, dentate, oblique from costa to vein 5, then bent outwards and again oblique from vein 2 to inner margin; outer margin whitish. Hindwing pure white.

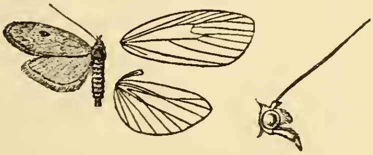
Habitat—Khásis. *Exp.* 30 mm.

Genus MELISSOBLAPTES.

Melissoblaptes, Zell., Isis., 1839, p. 180; *Paralipsa*, Butl., A. M. N. H., 1879, p. 455.

Type.—*M. bipunctanus*, Curt., from Europe.

Range.—Nearctic and palæarctic regions; China; Eastern Himalayas; Ceylon; New Guinea.



Melissoblaptes gularis, ♀ $\frac{1}{1}$.

Palpi of male minute, upturned, and tufted with hair; proboscis small; antennæ short, ciliated, the basal joint dilated and tufted with hair. Forewing rather long and narrow, the costa arched; the apex rounded; the outer margin short; the discocellulars angled; vein 6 from below upper angle, 7-8 stalked from 9; 10-11 from cell. Hindwing with vein 2 from angle of cell; 3 and 5 stalked; 4 absent; the discocellulars angled back, almost to base; 6-7 stalked; 7 anastomosing with 8. ♀. With the palpi porrect, down curved, and projecting about the length of head.

Section I (*Paralipsa*).—Forewing of male with the cell clothed below with fine close-set scales, the lower angle produced upwards and outwards, veins 3, 4, 5 at intervals; female with vein 3 from well before angle; 4-5 from angle.

4144*b*. MELISSOBLAPTES GULARIS, Zell., Hor. Ent. Ross, xiii, p. 72, pl. 1, f. 26; *Paralipsa tenebrosus*, Butl., Ill. Het., iii, p. 78, pl. 60, *f*. 1.

♂. Grey-brown with a yellowish tinge and strongly irrorated with black. Forewing with an ochreous streak from base on median nervure expanding into a triangular patch towards end of cell and sending three teeth outwards; a black speck edged with ochreous in cell; the discocellular stigma oval, black edged with ochreous; traces of a postmedial ochreous line on costal area; a marginal series of black points. Hindwing fuscous with a yellowish tinge; the apical area darker; a dark marginal line. ♀. Yellowish-brown with a purple tinge; an obscure antemedial sinuous line defined by pale ochreous; the postmedial line angled outwards at middle; no spot in cell; the discocellular stigma very large, black and subtriangular.

Habitat.—Japan; Sikkim. *Exp.* 30-32 mm.

Section II. (*Melissoblaptes*).—Forewing of male with the cell normal; vein 3 from near angle; 4-5 shortly stalked or from a point in both sexes.

4144*c*. MELISSOBLAPTES ODONTELLA, Hmpsn., Rom. Mem., viii, ined., pl. 54, *f.* 18.

♂. Head and thorax grey-brown; abdomen brownish. Forewing pale brown irrorated with black scales; the basal half of inner area whitish, extending into the cell beyond the antemedial lines, which is fine dark and very strongly dentate, especially below the cell; a large irregular brown stigma in end of cell, dentate on outer side; the postmedial line fine, dark and regularly dentate; a series of black streaks on the veins of outer area, ending in points. Hindwing fuscous-brown, slightly darker towards outer margin.

Habitat.—Ceylon. *Exp.* 18 mm.

P. 5. Genus **Mucialla,** insert TIRATHABA, Wlk., Cat., xxx p. 961 (1864), which has precedence; and *Harpagoneura*, Butl., A. M. N. H. (5), xv, p. 242 (1885).

4145. TIRATHABA RUFIVENA, insert (syn.) *Melissoblaptes rufovenalis*, Snell., Tijd. v. Ent., 1880, p. 243, and 1883, pl. 5, fig. 10.

4145*a*. TIRATHABA GRANDINOTELLA, Rag., Rom. Mem., viii, ined., pl. 45, f. 17.

♂. Head and thorax purplish-red; a small tuft of white scales overlapping base of forewing; abdomen brownish. Forewing dark purplish-red; a small annulus in base of cell, a larger one at middle, and a discocellular annulus with black margins and purple-red centres; the outer margin red, with some dark suffusion inside it at costa; some white points on costa towards apex and a marginal series. Hindwing fuscous. ♀. With a patch of grey scales in the cell between the annuli, a diffused patch of yellowish-grey scales round the discocellular annulus, and a series of quadrate grey marks just inside the margin. Hindwing pale yellowish, the apical half fuscous.

Habitat.—Khásis; Amboyna. *Exp.* 28-38 mm.

Section II (*Harpagoneura*).—Forewing of male with the lower angle of cell produced to near outer margin and upwards almost to level of upper angle, the discocellulars extremely oblique, veins 3, 4, 5 widely separated, short and parallel; the cell clothed below with fine silky hair, the glandular swelling at base of costa very large. In the typical species *complexa* from the Pacific there is also a small glandular swelling below veins 6, 7, 8, and the margin of the wing is atrophied.

4147*a*. TIRATHABA ROSELLA, Hmpsn., Rom. Mem., viii, ined., pl. 54, f. 8.

♂. Head and thorax pale reddish-brown; abdomen pinkish. Forewing pale reddish-brown irrorated with black scales; an indistinct blackish antemedial line, very oblique from costa to middle of cell, then angled inwards below the cell; four or five black points below subcostal nervure towards end of cell; a very indistinct postmedial line, oblique from costa to vein 6, strongly angled outwards to origin of vein 4, then bent inwards along median nervure; a prominent marginal series of black points. Hindwing dull reddish-pink, the cilia greyish; the apex produced and somewhat acute.

Habitat.—Khásis. *Exp.* 34 mm.

P. 6. Under **Lamoria**, insert (syn.) *Maraclea*, Wlk., Cat., xxvii, p. 88.

4149. LAMORIA *planalis*, insert *Pempelia* **adaptella**, Wlk., Cat., xxvii, p. 74, which has precedence; and (syn.) *Lamoria obscurellus*, Saalm., Jahr. Senek. Nat. Ges., 1880, p. 308; Rag., Rom. Mem., viii, pl. 45, f. 12.

4150. Delete *Pempelia adaptella*, and insert (syn.) *Lamoria jordanis*, Rag., Rom. Mem., viii, pl. 46, f. 5.

4150*a*. LAMORIA VIRESCENS, Hmpsn., Rom. Mem., viii, ined., pl. 53, f. 1.

♂. Head, thorax and abdomen pale brownish. Forewing pale brown irrorated with dark brown, and with a slight olive tinge towards outer margin, the costal area browner, and with ill-defined dark patches at middle and towards apex; the outer area more fuscous; a black point at base of cell and another at middle; an ill-defined discoidal annulus; a very indistinct antemedial line, oblique from costa to below cell, where it is obtusely angled; the postmedial line strongly dentate and excurved at middle; a marginal series of black points. Hindwing whitish, tinged with fuscous. ♀. With the base of forewing strongly suffused with black, especially below cell; the antemedial line more distinct and angled inwards on vein 1; the outer area more distinctly greenish, with the veins streaked with black.

Habitat.—Sikkim. *Exp.* ♂ 24, ♀ 27 mm.

4150*b*. LAMORIA INFUMATELLA, Hmpsn., Rom. Mem., viii, ined., pl. 53, f. 5.

♀. Head, thorax and abdomen grey-black; the thorax and base of abdomen brownish. Forewing pale brownish, almost entirely suffused with black, which is deepest at base and in cell; an indistinct postmedial line, strongly dentate and excurved at middle; a marginal series of black points. Hindwing brownish-fuscous, the cilia grey.

Habitat.—Sikkim. *Exp.* 50 mm.

4151. ACARA MOROSELLA. Insert. (syn.) *Galleria macroptera*, Snell. Tyjd. v. Ent., xxiii, p. 249.

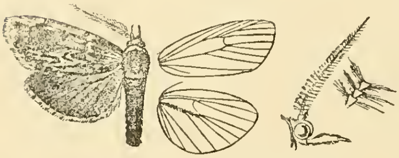
P. 8. Under **Galleria**, insert (syn.) *Vindana*, Wlk., Cat., xxxv, p. 1,706 (1866).

4152. GALLERIA MELLONELLA. Insert. (syn.) *Vindana obliquella*, Wlk., Cat., xxxv, p. 1,706.

P. 9. Genus EMBRYOGLOSSA.

Embryoglossa, Warr., A. M. N. H. (6), xviii, p. 225 (1896).

Proboscis rudimentary; palpi porrect and slender, extending about two and-a-half times the length of the head; maxillary palpi extremely minute; frons rounded; antennæ short, ciliated, with a large tuft of hair on basal joint in female; in male minutely serrate, with tufts of long cilia. Forewing with the outer margin evenly curved; vein 3 from before angle of cell, veins 4-5 from angle; 6, from upper angle; 7, 8, 9, stalked; 10-11, free. Hindwing with veins 3, 4, 5, from angle of cell; 6-7 from upper angle; 8 free.



Embryoglossa variegata, ♂ $\frac{1}{1}$.

4152*a*. EMBRYOGLOSSA VARIEGATA, Warr., A. M. N. H. (6), xviii, p. 226; Rom. Mem., viii, pl. 53, f. 8.

Head rufous; palpi with some black above; thorax and abdomen rufous and black. Forewing green, suffused with rufous and black, especially on basal area and between lower angle of cell, vein 2, and apex; the basal area bounded by traces of a pale, waved, antemedial line; a very prominent discocellular black lunule; an indistinct pale dentate postmedial line, excurved from costa to near margin at vein 3, then inwardly oblique, the area from it to outer angle rufous. Hindwing silky fuscous; the cilia ochreous.

Habitat.—Khàsis. *Exp.* ♂ 28, ♀ 44 mm.

(*To be continued.*)

DESCRIPTION OF A NEW SPECIES OF *MUS* FROM SOUTH INDIA.

By J. L. Bonhote.

[*With a Plate.*]

(*Read before the Bombay Natural History Society on 14th June*, 1898.)

Owing to the kind intervention of Mr. E. Thurston, of the Madras Museum, the British Museum has been presented by Mr. Charles Grey with a specimen of a mouse which he obtained at Coonoor on the Nilgiri Hills. Being at present interested in Asiatic mammals, Mr. Thomas has handed it to me to work out. It proves to be a new species, distantly allied to *Mus musculus*, and I would propose for it the name

Mus famulus, sp. n.

Allied to ***M. musculus***, but larger, and with, as far as can be judged from the skin, a proportionately shorter tail. Fur long, soft, and close. Ears moderate and rounded, with a few short hairs on the inner side. Colour above dark chocolate-brown, evenly sprinkled with fulvous, below brownish-yellow, not sharply marked off from the colour of the back. Each hair on the back is slatey-grey at the base, shading into dark brown or ending in a light tip. Hands and feet dark brown. Tail of the same colour as the back, rather lighter below, and covered with short hairs.

The skull is similar in general shape above to that of *M. musculus*, but the muzzle is more elongated, and the bony palate does not extend so far back. The pterygoids are nearly parallel, and do not converge anteriorly. The auditory bulla is rather more elongated. The vertical plate of the zygoma has a straight anterior margin, and is unusually inclined outwards, making the infra-orbital opening considerably wider above than in the allied species. The incisors are simple and flattened laterally; molars as usual.

Dimensions of the type, an old specimen, probably a male, measured in skin—

Head and body 100 mm.; tail 71 mm.; hind foot 20 mm.; ear 12 mm.

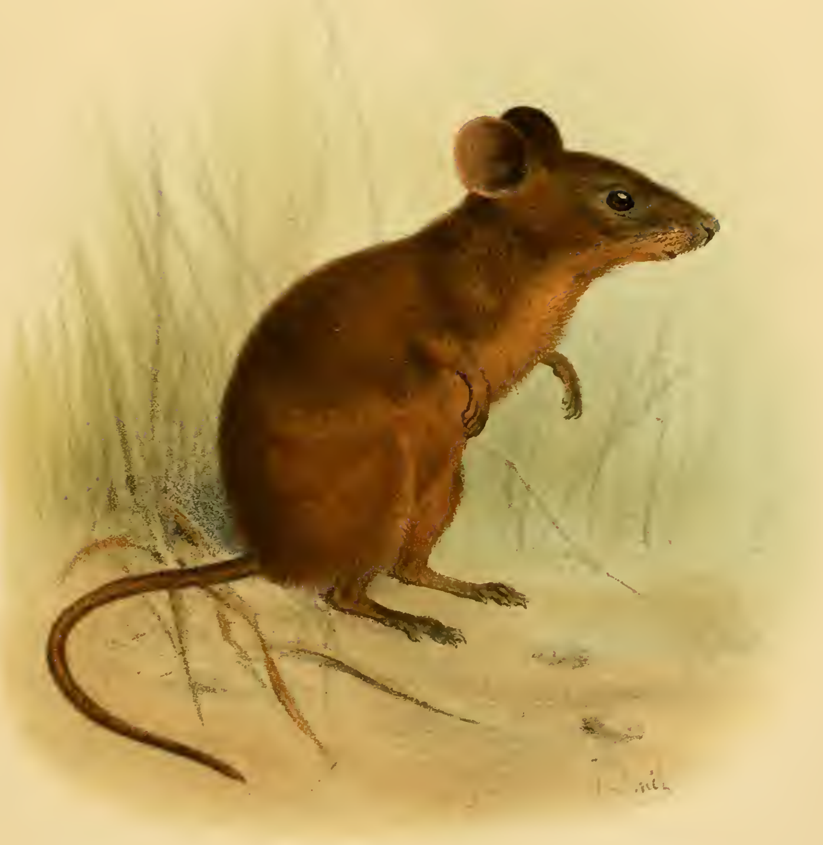
Skull.—Basilar length 20 mm.; basal length 21 mm.; breadth 12·5 mm.; interorbital constriction 4·5 mm.; nasals 9 × 2 mm.; henselion to back of palate 11 mm. ; diastema 7 mm. ; molar series 4 mm. ; palatal foramina 5 × 2 mm. ; breadth of zygoma at root 2 mm.

Habitat—Coonoor, Nilgiri Hills, S. India. Altitude 5,000 feet.

Type.—British Museum 97-11-12-1. Collected and presented by Mr. Charles Grey.

Although, as above noted, this mouse has a skull resembling in a general way that of *M. musculus* and its allies, yet the detailed cranial differences are very marked, while in colour it is absolutely different from any species as yet known from India.

Jerdon's *Mus nilagiricus* (Jerdon's "Mammals of India," p. 203, 1867), which also has a yellow body and comes from the same district, is, as he supposed, clearly a *Vandeluria*, and is considered by Blanford as a synonym of *V. oleracea*, (Sykes.)



J. Smit del et lith.

Mintern Bros. Chromo London.

A NEW INDIAN MOUSE.

Mus famulus, *Bonhote*.

THE ACULEATE *HYMENOPTERA* PROCURED AT ADEN BY COL. YERBURY, R.A., AND CAPT. NURSE, I.S.C.

[*With Plate A.*]

By Lieut.-Col. C. T. Bingham, F. Z. S., F. E. S.

(*Read before the Bombay Natural History Society, on 30th Sept.*, 1897.)

The two collections kindly submitted to me for examination by Lieut.-Col. Yerbury and Capt. Nurse contained one hundred and seven species, of which four I believe to be previously undescribed.

The preponderance of Palæartic species is noticeable, while, as was to be expected, both Ethiopian and Indian forms are represented in lesser numbers.*

Family MUTILLIDÆ.

1. Mutilla chrysophthalma, Klug.

Mutilla chrysophthalma, Klug, Symb. Phys., Dec. 1, No. 3, t. 4, f. 3.

Aden (*Col. Yerbury*), one worn ♀. Occurs also in Egypt and Ceylon.

2. Mutilla arabica, Oliv.

Mutilla arabica, Oliv., Encycl. Méth., viii, p. 59.

Aden (*Col. Yerbury*).

3. Mutilla aurea, Klug.

Mutilla aurea, Klug, Symb. Phys., Dec. 1, No. 13, t. 4, f. 13.

Shaikh Othman (*Col. Yerbury*).

4. Mutilla æstuans, Gerst.

Mutilla æstuans, Gerst., Pet. Reise Mozamb., v, p. 487, pl. 31, fig. 6, ♀.

Aden, Lakej, Hanthaburi (*Col. Yerbury*), Ceylon.

The ♂ has not been described in my Vol. I, "Hymenoptera of India." Col. Yerbury took ♂ and ♀ *in cop.* at Aden.

Desc. ♂. Head, thorax and abdomen closely but not strongly punctured, a space on the middle of the 2nd abdominal segment above, close to its posterior margin highly polished and shining, impunctate; head not so wide as the thorax, front below the ocelli raised, almost tuberculate, scutellum raised, produced into a sharp cone; median

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* The original M.S. of this paper was posted in London, but apparently never reached the office of this Journal. The present list of the *Hymenoptera* of Aden has been compiled from pencil notes made by me at the British Museum while I was working out Colonel Yerbury's and Capt. Nurse's collections.

segment broad, rounded above, truncate posteriorly, the face of the truncation coarsely rugose ; abdomen long, longer than head and thorax united, apical segment bearing a broad smooth medial longitudinal carina ; basal ventral segment strongly longitudinally keeled, the keel slightly emarginate in the middle. Head, thorax and base of the 1st abdominal segment black, remainder of the abdomen bright ferruginous-red, the clypeus, face cheeks, scape and basal joint of the flagellum of the antennæ, the pronotum above, the mesopleuræ, the median segment above and the legs covered with silvery pubescence, which is thick and matted on the clypeus and front, and on the median segment ; posterior margin of the 2nd and the whole of the remaining abdominal segments clothed with rich glistening ferruginous pubescence ; wings fuscous, the forewings beyond the area of the cells much darker.

Length 8-13 ; Exp. 17-27 mm.

5. MUTILLA TESTACEA, Klug.

Mutilla testacea, Klug, Symb. Phys., Dec. 1, No. 15, t. 5, f, 4.

Shaik Othman (*Col. Yerbury*).

Family SCOLIIDÆ.

6. TIPHIA BREVIPENNIS, Lucas.

Tiphia brevipennis, Lucas, Expl. Sc. Algér., iii, p. 299, t. 15, f. 9.

Aden (*Capt. Nurse*).

7. MYZINE GUERINII, Lucas.

Myzine guerinii, Lucas, Expl. Sc. Algèr., iii, p. 283, t. 15, f. 5, ♂.

Lahej (*Capt. Nurse*).

8. SCOLIA (DISCOLIA) DISPAR, Klug.

Scolia dispar, Klug, Symb. Phys., Dec. iii, t. 26, f. 10 ♂ and 2 ♀.

Shaikh Othman, Lahej (*Capt. Nurse*).

9. SCOLIA (DISCOLIA) RUFIPES, Smith.

Scolia rufipes, Smith, Cat. Hym. B. M., iii, p. 95, ♂.

Lahej (*Capt. Nurse*).

10. SCOLIA (DISCOLIA) ERYTHROCEPHALA, Fabr.

Scolia erythrocephala, Fabr., Ent. Syst., Suppl., p. 255, 16.

Aden (*Col. Yerbury*).

11. SCOLIA (DISCOLIA) MICROMELAS, Sichel.

Scolia micromelas, Sich., Sauss. and Lich. Cat. *Scol.*, p. 82. ♀ & ♂.

Aden (*Col. Yerbury*).

12. Elis (Trielis) aliena, Klug.

Scolia aliena, Klug, Symb. Phys., Dec. iii, No. 12, p. 27, fig. 3.

Lahej (*Col. Yerbury*).

13. Elis (Dielis) collaris, Fabr.

Tiphia collaris, Fabr., Syst. Ent., p. 354.

Aden and Lahej (*Col. Yerbury*).

14. Elis (Dielis) cœlebs, Sichel.

Elis cœlebs, Sich., Sauss. and Lich. Cat. *Scol.*, p. 184 ; id., app., p. 297

Shaikh Othman and Lahej (*Capt. Nurse*).

15. Elis (Dielis) ciliata, Fabr.

Scolia ciliata, Fabr., Mantissa, ii, p. 279.

Lahej (*Capt. Nurse*).

16. Elis (Dielis) fasciatella, Klug.

Scolia fasciatella, Klug, Symb. Phys., Dec. iii, t. 27, f. 8.

Shaikh Othman (*Capt. Nurse*).

Family POMPILIDÆ.

17. Salius (Priocnemis) brunneus, Klug.

Pompilus brunneus, Klug, Symb. Phys., Dec. iv, No. 2, t. 38, f. 2.

Aden (*Col. Yerbury*).

18. Salius (Priocnemis) rubescens, Smith.

Pompilus rubescens, Smith, Cat. Hym. B. M., iii, p. 136.

Aden (*Col. Yerbury*).

19. Pompilus anticus, Klug.

Pompilus anticus, Klug, Symb. Phys., Dec. iv, No. 10, t. 38, f. 10.

Lahej (*Col. Yerbury*).

20. Pompilus gracilis, Lepel.

Pompilus gracilis, Lepel, Hymn., iii, p. 420, 6.

Lahej (*Capt Nurse*). One specimen which is indistinguishable from specimens from France so labelled in the British Museum.

21. Pompilus vagabundus, Smith.

Pompilus vagabundus, Smith, Jour. Linn. Soc., 1858, p. 92.

Huswah (*Capt. Nurse*). Another species which I identify with doubt. If it is really *P. vagabundus*, the insect has a very wide range, from Borneo to Aden.

22. Pompilus vespiformis, Klug.

Pompilus vespiformis, Klug, Symb. Phys., Dec. iv, No. 3, t. 38, f. 3.

Aden, Lahej (*Col. Yerbury* and *Capt. Nurse*).

23. Pompilus candidus, Smith.

Pompilus candidus, Smith, New Sp. Hym. B. M., p. 142, 9. ♀.

Lahej (*Col. Yerbury*).

24. Pompilus unifasciatus, Smith.

Pompilus unifasciatus, Smith, Cat. Hym. B. M., iii, p. 145, 133.

Aden (*Col. Yerbury*). A widely distributed species.

Family SPHEGIDÆ.

25. Tachytes albocincta, Lucas.

Tachytes albocincta, Lucas, Expl. Sc. Algér., iii, p. 246, 211.

Lahej (*Col. Yerbury*), Shaikh Othman (*Capt. Nurse*).

26. Tachysphex filicornis, Kohl.

Tachysphex filicornis, Kohl., Deutsche Ent. Zeits., xxvii (1883), p. 169.

Aden (*Col. Yerbury*).

27. Tachysphex pygidialis, Kohl.

Tachysphex pygidalis, Kohl., Deutsche Ent. Zeits., xxvii (1883), p. 176. ♂ and ♀.

Aden (*Col. Yerbury*).

28. Tachysphex panzeri, Van d. Lind.

Tachytes panzeri, Vand. Lind., Nouv. Mem. Acad. Sc. Bruxell., v (1829), p. 20, 4. ♂ and ♀.

Aden, Lahej (*Col. Yerbury*).

29. Tachysphex psilopus, Kohl.

Tachysphex psilopus, Kohl., Verh. d. k. k. Zool.-Bot. Gesellsch. Wien, xxxiii (1883), p. 371, 3, ♂, pl. xvii (*a*), figs. 2 and 3.

Aden (*Col. Yerbury*).

30. Tachysphex fluctuatus, Gerst.

Lyrops fluctuatus, Gerst., Monat. Verh. d. k. Akad. d. Wissensch., Berlin, 1857, p. 510.

Aden, Lahej, Shaikh Othman (*Col. Yerbury* and *Capt. Nurse*).

31. Notogonia pompiliformis, Panz.

Larra pompiliformis, Panz., Faun. Ins. Germ., 1808, Heft. 17, p. 106.

Aden (*Col. Yerbury*).

32. Liris hœmorrhoidalis, Fabr.

Pompilus hæmorrhoidalis, Fabr. Syst. Piez., p. 198, 55.

Aden (*Col. Yerbury*).

33. AMMOPHILA INCANA, Dahlb.

Ammophila incana, Dahlb., Hym. Europ., i, p. 21.

Aden (*Col. Yerbury* and *Capt. Nurse*).

34. AMMOPHILA INSIGNIS, Smith (Var.?).

Ammophila insignis, Smith, Cat., iii, p. 213, 30. ♂ ♀.

Aden (*Capt. Nurse*), Lahej (*Col. Yerbury*).

35. AMMOPHILA HOLOSERICEA, Fabr.

Sphex holosericea, Fabr., Ent. Syst., ii, p. 205, 27.

Aden (*Col. Yerbury*), Lahej (*Capt. Nurse*).

36. SCELIPHRON SPIRIFEX, Linn.

Sphex spirifex, Linn., Syst. Nat., i, p. 942, 9.

Aden, Lahej (*Col. Yerbury* and *Capt. Nurse*).

37. SCELIPHRON VIOLACEUM, Fabr.

Sphex violacea, Fabr., Ent. Syst., ii, p. 201.

Aden (*Col. Yerbury* and *Capt. Nurse*).

38. SPHEX UMBROSUS, Christ.

Sphex umbrosa, Chr., Naturg. Ins., p. 293, t. xxix, f. 2 ♀.

Aden (*Col. Yerbury* and *Capt. Nurse*). All the specimens belong to the variety *S. metallica*, Taschenb.

39. SPHEX AURULENTUS, Fabr.

Sphex aurulenta, Fabr., Mant. Ins., i, p. 274.

Aden (*Col. Yerbury*). The one specimen in the collection belongs to the variety *S. lineola*, Lepel.

40. SPHEX NIGROPECTINATUS, Taschenb.

Sphex nigropectinatus, Taschb., Zeitschr. f. d. ges. Naturwiss. Holle. xxxiv (1869), p. 409.

Aden (*Col. Yerbury*).

41. SPHEX VIDUATUS, Christ.

Sphex viduata, Chr., Naturg. Ins., p. 305, t. xxx, f. 4.

Aden (*Col. Yerbury* and *Capt. Nurse*).

42. NYSSON SCALARIS, Illig.

Nysson scalaris, Illig., ed. Faun. Etrusc., ii, p. 157.

Lahej (*Col. Yerbury*).

43. HELIORYCTES ASSIMILIS, Bingh.

Helioryctes assimilis, Bingh., Faun. Brit. Ind. Hym., i, p. 271.

Aden (*Col. Yerbury*).

44. GORYTES COARCTATUS, Spin.

Gorytes coarctatus, Spin., Ins., Lig., ii, p. 245, t. v, f. 24.

Shaikh Othman (*Capt. Nurse*).

45. STIZUS VESPOIDES, Walk.

Larra vespoides, Walk., List of Hym. coll. by J. K. Lord in Egypt, &c., p. 25, 224. ♀.

Aden (*Col. Yerbury* and *Capt. Nurse*).

46. STIZUS DISCOLOR, Handl.

Stizus discolor, Handl., Sitz. d. k. Akad. Wissens. Wien. (1892), p. 78, 44.

Aden (*Capt. Nurse*).

47. STIZUS PRISMATICUS, Smith.

Larra prismatica, Smith, Jour. Linn. Soc. (1858), p. 103., ♂ ♀

Aden (*Col. Yerbury*).

48. STIZUS KLUGII, Smith.

Larra apicalis, Klug (nec Guér), Symb, Phys., Dec. V, 46, p. 13.

Larra klugii, Smith, Cat. Hym. B. M., iv, p. 345, 33.

Aden (*Col. Yerbury*).

49. BEMBEX OLIVACEA, Fabr.

Bembex olivacea, Fabr., Mant. Ins., i, p. 285, 4. ♂.

Aden (*Col. Yerbury* and *Capt. Nurse*).

50. BEMBEX CHLOROTICA, Spin.

Bembex chlorotica, Spin., Ann. Soc. Ent. Fr. (1838), p. 469.

Aden (*Capt. Nurse*), Lahej (*Col. Yerbury*).

51. BEMBEX DAHLBOMII, Handl.

Bembex dahlbomii, Handl., Sitzungsb. d. k. Akad. Wissens. Wien., cii ; (1893), p. 806, 62.

Aden (*Col. Yerbury*).

52. PHILANTHUS YERBURYI, n. sp., pl. A, f. 2.

♀. Head wider than thorax, finely and closely punctured, clypeus slightly convex, much broader than high, the anterior margin waved and fringed with a line of dense pubescence, eyes distinctly convergent towards the vertex below, reaching down to the base of the mandibles, vertex broad, ocelli in a triangle situated somewhat anteriorly, cheeks broad, well developed ; thorax shining, mesonotum with a few fine scattered punctures, median segment above only slightly convex, almost flat, bearing fine longitudinal striæ, its sides and apex roundly truncate; legs without pubescence, the intermediate and posterior tibiæ and tarsi thickly spinose, claws of the tarsi simple; abdomen longer than the head and thorax united, smooth, pygidial area flat, elongate triangular, the sides and apex margined, the surface very finely and closely rugose punctate. Head and thorax black, the basal two-thirds of the mandibles, the clypeus, a triangular mark along the inner orbits, the posterior margin of the pronotum, an oval spot on the scutellum and a transverse line on the post-scutellum yellowish-white, legs dull Indian-red, the anterior femora beneath pale yellowish-white; wings hyaline, nervures testaceous-brown, tegulæ pale yellow, the posterior half brownish; in the anterior wing the basal nervure is nearly interstitial, the radial cell elongate, narrow acute at apex, the 1st recurrent nervure is received in the 2nd cubital cell about one-third of its length from base, the 2nd recurrent nervure is received by the 3rd cubital cell close to its base. Abdomen dull Indian-red, segments 1 to 5 with broad transverse pale yellowish-white stripes on their posterior margins, each stripe bi-marginate anteriorly.

What seems to be a variety of the same insect differs in having the abdomen of a brighter red, and the transverse pale yellow stripes on the segments above reduced to two spots on the 2nd and an irregular medial mark on the posterior margin of the 3rd segment.

♀. *Length* 10-12. *Exp.* 19-25 mm.

Aden (*Col. Yerbury*).

53. TRACHYPUS SUBCONCOLOR, n. sp., pl. A, f. 1.

♀. Head wider than the thorax, finely and closely punctured, clypeus slightly convex, its anterior margin arched in the middle, waved at the sides, eyes slightly convergent towards the vertex, below reaching almost to the base of the mandibles, their inner orbits emarginate, the vertex and cheeks broad and well developed. Thorax: the pronotum, smooth and shining, the mesonotum and sides of the thorax very coarsely but not very closely punctured, the scutellum, post-scutellum, and median segment shining with a few scattered coarse punctures, the last subtriangular, above smooth, with a medial short longitudinal groove, which, as well as the well-marked sutures between the scutellum and post-scutellum and between the latter and the median segment, is densely and closely punctured; legs sub-pilose, the anterior tibiæ ciliated with long spines, the intermediate and posterior tibiæ and tarsi thickly spinose, claws of the tarsi simple; abdomen about as long as the head and thorax united, the posterior margin of the 1st segment constricted, pygidial area smooth, shining, convex. Head, thorax and abdomen dark yellowish-brown, a small crescentic spot above the base of each antenna, an arched stripe across the vertex over the region of the ocelli; the mesonotum, irregular shadings on the sides of the thorax, the sutures between the scutellum, post-scutellum and median segment and the short longitudinal groove on the last black, the mesonotum with two parallel, longitudinal, short, ferruginous-red stripes; wings hyaline, tegulæ and nervures pale testaceous.

♀. *Length* 11. *Exp.* 18 mm.

Shaikh Othman (*Col. Yerbury*).

54. TRACHYPUS NURSEI, n. sp., pl. A, f. 3.

♀. Head finely punctured, shining, about as broad as the thorax, clypeus broad, slightly convex, very slightly arched anteriorly, eyes strongly converging towards the vertex, the inner orbits emarginate, front broad, with a short shallow vertical furrow below the anterior ocellus, cheeks narrow, little developed. Thorax shining, the mesonotum coarsely punctured, the scutellum, post-scutellum and median segment above smooth, shining, with a few scattered punctures, the sutures between the mesonotum, scutellum, post-scutellum and median segment deep, well marked and finely punctured, as is a medial, short, shallow longitudinal furrow on the median segment above, the tibiæ and tarsi of the leg spinose, the claws simple. Abdomen shining, finely punctured, about as long as the head and thorax united, the base of the 1st segment attenuated, its posterior margin deeply constricted, pygidial area convex, smooth and shining. Black, the basal two-thirds of the mandibles, the scape and basal two joints of the flagellum of the antennæ in front, an oval transverse spot on the front, two contiguous spots on the vertex behind the ocelli, a broad line on the cheeks, the posterior half of the pronotum, the tubercles, two spots behind them on the mesopleuræ, the scutellum and post-scutellum, a round spot on each side at the posterior angles of the median segment, the apical half of the anterior tibiæ, a transverse band on the upper side of the 1st abdominal segment, and the whole of the second segment bright yellow, the apex of the mandibles ferruginous, the clypeus, a triangular spot along the inner orbits, the anterior tarsi, the intermediate and posterior tibiæ and tarsi, the posterior margin of the 4th abdominal segment above, and the whole of the apical segment, lacteous-white; wings hyaline, nervures testaceous, tegulæ yellow.

♂. Similar, the apical abdominal segment black, the 6th segment with a narrow medially interrupted line on the apical margin above pale yellow.

♀. *Length* 9. *Exp.* 17 mm.
♂. „ 8. „ 13 „

Lahej and Shaik Othman (*Capt. Nurse*).

55. Cerceris pulchella, Klug.

Cerceris pulchella, Klug., Symb. Phys., Dec. v, t. 47, f. 14. ♂.
Huswah (*Capt. Nurse*).

56. Cerceris vidua, Klug.

Cerceris vidua, Klug., Symb. Phys., Dec. v, t. 47, f. 11. ♂.
Shaikh Othman (*Capt. Nurse*),

57. Cerceris spinipectus, Smith.

Cerceris spinipectus, Smith, Cat. Hym. B. M., iv, p. 443, 30. ♀ . ♂.
Shaikh Othman (*Capt. Nurse*).

58. Cerceris insignis, Klug.

Cerceris insignis, Klug, Symb. Phys., Dec. v, t, 47, f. 12. ♀.
Aden (*Col. Yerbury*).

59. Oxybelus arabs, Lepel.

Oxybelus arabs, Lepel., Hym., iii, p. 213, 3.
Aden (*Col. Yerbury* and *Capt. Nurse*).

Family EUMENIDÆ.

60. Eumenes tinctor, Christ.

Sphex tinctor, Christ., Naturges, p. 341, t. 31, f. 1.
Aden (*Capt. Nurse*), Shaik Othman (*Col. Yerbury*).

61. Eumenes dimidiatipennis, Sauss.

Eumenes dimidiatipennis, Sauss., Mon. Guêp. Sol., p. 51, 23.
Aden, (*Col. Yerbury*), Lahej (*Capt. Nurse*).

62. Eumenes lepeleterii, Sauss.

Eumenes lepeleterii, Sauss., Mon. Guêp. Sol., p. 4524, t. 10, f. 3. ♀
Aden, Lahej, Shaikh Othman (*Col. Yerbury* and *Capt. Nurse*)
Common.

63. Rhynchium cyanopterum, Sauss.

Rygchium cyanopterum, Sauss., Mon. Guêp. Sol., p. 108-9.
Aden (*Col. Yerbury*), Lahej (*Capt. Nurse*).

64. RHYNCHIUM BRUNNEUM, Fabr.

Vespa brunnea, Fabr., Ent. Syst., ii, p. 264, 41.

Aden (*Col. Yerbury*).

65. RHYNCHIUM OCULATUM, Fabr.

Vespa oculata, Fabr., Spec. Ins., i, p. 463.

Aden (*Col. Yerbury*).

66. RHYNCHIUM SYNAGROIDES, Sauss.

Rhynhium synagroides, Sauss., Mon. Guêp. Sol., p. 103, 1. t. 14, f. 2. ♂

Lahej (*Capt. Nurse*).

67. ODYNERUS CHLOROTICUS, Spin.

Odynerus chloroticus, Spin., Ann. Soc. Ent. Fr., 1st ser., vii, p. 500.

Shaikh Othman (*Capt. Nurse*).

68. ODYNERUS EUMENOIDES, Smith.

Odynerus eumenoides, Smith, Cat. Hym. B. M., v, p. 71, 134.

Aden (*Capt. Nurse*).

69. ODYNERUS FERVIDUS, Sauss.

Odynerus fervidus, Sauss., Mon. Guêp. Sol., Suppl., p. 288, 174.

Shaikh Othman (*Capt. Nurse*).

70. ODYNERUS FASTIDIOSUS, Sauss.

Odynerus fastidiosus, Sauss., Mon. Guêp. Sol., p. 189, 85. ♀

Aden (*Col. Yerbury* and *Capt. Nurse*).

71. ODYNERUS BIPHALERATUS, Sauss.

Odynerus Biphaleratus, Sauss., Mon. Sol., p. 134, 14, t. 16, f. 2.

Lahej (*Col. Yerbury*), Shaik Othman (*Capt. Nurse*).

Family VESPIDÆ.

72. ICARIA ANARCHICA, Sauss.

Icaria anarchica, Sauss., Mon. Guêp. Sol., p. 34, 12, t. 4, f. 5.

Aden, Lahej (*Col. Yerbury* and *Capt. Nurse*).

73. ICARIA CINCTA, Lepel.

Epipona cincta, Lepel., Hym., i, p. 541, 2.

Aden (*Capt. Nurse*).

74. POLISTES MARGINALIS, Fabr.

Vespa marginalis, Fabr., Syst. Ent., p. 367, 24.

Lahej (*Col. Yerbury* and *Capt. Nurse*).

Family MASARIDÆ.

75. Celonites fischeri, Spin.

Celonites fischeri, Spin., Ann. Soc. Ent. Fr. (1838), p. 505.

Aden (*Col. Yerbury* and *Capt. Nurse.*)

No specimen in either collection is typical, all being much lighter in colour than specimens of this species in the British Museum. One ♂ taken by Col. Yerbury is exceedingly small, measuring only 5½ mm. Capt. Nurse notes that he bred the insect from cylindrical mud nests.

Family COLLETIDÆ.

76. Prosopis fraterna, n. sp.

Closely allied to and resembling *P. absoluta*, Cam. (Mem. Manch. Lit. & Phil. Soc., XLI, p. 92); differs in sculpturing and considerably in colour and size.

♀. Head, thorax and abdomen finely and closely, median segment coarsely and rugosely punctured, clypeus slightly convex, vertically oval, its anterior margin rounded; space between the antennæ smooth and shining, with a very short fine vertical furrow, mesonotum strongly convex, with three abbreviated parallel longitudinal furrows on the disc anteriorly; median segment with a smooth and shining Y-shaped furrow; legs slightly pilose; abdomen about as long as the head and thorax united, the apical margin of the first segment slightly constricted. Black, the base of the mandibles, the clypeus, a spot above it, the sides of the face, the scape of the antennæ in front, a line on the pronotum, and the tibiæ and tarsi of all the legs pale yellow; the flagellum of the antennæ in front pale, the tubercles and tegulæ dark ferruginous; a narrow line of dense grey pubescence on the posterier margin of the 1-4 abdominal segments, that on the 1st segment broadly, on the 2nd segment narrowly, interrupted in the middle,; wings hyaline and iridescent.

♀. *Length* 4. *Exp.* 9 mm.

Aden (*Col. Yerbury*).

77. Prosopis scutellata, Spin.

Prosopis scutellata, Spin., Ann. Soc. Ent. Fr., 2nd Ser., i, p. 506.

Aden (*Col. Yerbury*).

Family APIDÆ.

78. Halictus jucundus, Smith.

Halictus Jucundus, Smith, Cat. Hym. B. M., 1, p. 56, 65. ♀ ♂.

Aden, Lahej, Shaikh Othman (*Capt. Nurse*).

79. HALICTUS SENESCENS, Smith.

Halictus senescens, Smith, New sp. Hym. B. M., p. 30. ♀.

Lahej (*Capt. Nurse*).

80. NOMIA TRIDENTATA, Smith.

Nomia tridentata, Smith, Trans. Ent. Soc. (1875), p. 64, 26. ♂.

Huswah (*Capt. Nurse*), Aden (*Col. Yerbury*).

81. NOMIA ZONARIA, Walk.

Nomia zonaria, Walk., List of Hym. Coll. by J. K. Lord in Egypt, &c., p. 346.

Aden (*Capt. Nurse*).

82. NOMIA LAMELLATA, Smith.

Nomia lamellata, Smith, Trans. Ent. Soc. (1875), p. 65, 28. ♀ ♂.

Aden (*Col. Yerbury* and *Capt Nurse*).

83. NOMIA TEGULATA, Smith.

Nomia tegulata, Smith, Trans. Ent. Soc. (1875), p. 69. ♀.

Lahej, Shaikh Othman (*Capt. Nurse*).

84. NOMIA OXYBELOIDES, Smith.

Nomia oxybeloides, Smith, Trans. Ent. Soc., 1875, p. 42. ♀ ♂.

Aden, Shaikh Othman (*Col. Yerbury*).

85. MEGACHILE ÆGYPTIA, Lepel.

Megachile ægyptia, Lepel, Hym., ii, p. 331.

Aden (*Col. Yerbury*).

86. MEGACHILE BASALIS, Smith.

Megachile basalis, Smith, Cat. Hym., B. M., i, p. 159. ♀.

Lahej (*Col. Yerbury*), Shaikh Othman (*Capt. Nurse*).

87. MEGACHILE EURIMERA, Smith.

Megachile eurimera, Smith, Cat. Hym., B. M., i, p. 163. ♀.

Lahej (*Capt. Nurse*).

88. MEGACHILE BARBATA, Smith.

Megachile barbata, Smith, Cat. Hym., B. M., i, p. 162. ♂.

Lahej, Shaikh Othman (*Capt. Nurse*).

89. MEGACHILE RUFIPES, Fabr.

Apis rufipis, Fabr., Ent. Syst., ii, p. 328, 62.

Aden, Shaikh Othman (*Capt. Nurse*).

90. ANTHIDIUM PULCHELLUM, Klug.

Anthidium pulchellum, Klug., Symb. Phys., Dec. iii, No. 11, t. 28, f. 11.

Aden, Shaikh Othman (*Capt. Nurse*).

91. Anthidium cinctum, Klug.

Anthidium cinctum, Klug, Symb., Phys., Dec. iii, No. 8, t. 28, f. 8.
Huswah (*Capt. Nurse*).

92. Anthidium afrum, Lepel.

Anthidium afrum, Lepel., Hym., ii, p. 387, 33.
Aden, Shaikh Othman (*Col. Yerbury*).

93. Anthidium ordinatum, Smith.

Anthidium ordinatum, Smith, new sp. Hym., B. M., p. 86. ♂ ♀.
Lahej (*Col. Yerbury*).

94. Ceratina viridis, Guér.

Ceratina viridis, Guér., Icon. R. An. Ins., p. 444, t. 73, f. 6.
Lahej (*Capt. Nurse*).

95. Crocisa scutellaris, Fabr.

Nomada scutellaris, Fabr., Ent. Syst., ii, p. 346, 2.
Lahej, Shaikh Othman (*Col. Yerbury* and *Capt. Nurse*).

96. Anthophora fallax, Smith.

Anthophora fallax, Smith, new sp. Hym., B. M., p. 120, 3. ♀.
Aden (*Col. Yerbury*).

97. Anthophora incana, Klug.

Megilla incana, Klug, Symb. Phys., Dec. Vt. 49, f. 12. ♀.
Aden (*Capt. Nurse*).

98. Anthophora torrida, Smith.

Anthophora torrida, Smith, new sp. Hym., B. M., p. 120, 2 ♀.
Lahej (*Capt. Nurse*).

99. Anthophora nubica, Lepel.

Anthophora nubica, Lepel., Hym., ii, p. 33, 8. ♀.
Lahej, Shaikh Othman (*Col. Yerbury* and *Capt. Nurse*).

100. Anthophora ferruginea, Lepel.

Anthophora ferruginea, Lepel., Hym., ii, p. 78, 45.
Aden (*Col. Yerbury*).

101. Anthophora quadrifasciata, de Vill.

Apis quadrifasciata, de Vill., Ent., iii, p. 349, 90.
Aden (*Col. Yerbury*).

102. Anthophora niveo-cincta, Smith.

Anthophora niveo-cincta, Smith, Cat. Hym., B. M., ii, p. 337, 92.
Shaikh Othman (*Col. Yerbury*).

103. ANTHOPHORA FARINOSA, Klug.

Megilla farinosa, Klug, Symb. Phys., Dec. V, t. 50, f. 2. ♀.

Huswah (*Capt. Nurse*).

104. XYLOCOPA ÆSTUANS, Linn.

Apis æstuans, Linn., Lyst. Nat., i, p. 961, 53. ♂.

Aden, Shaikh Othman (*Col. Yerbury*).

105. XYLOCOPA HOTTENTOTTA, Smith.

Xylocopa hottentotta, Smith, Cat. Hym., B. M., ii, p. 349, 26. ♀.

Aden (*Col. Yerbury*).

106. XYLOCOPA CALENS, Lepel.

Xylocopa calens, Lepel., Hym., ii, p. 196, 40. ♂.

Aden (*Capt. Nurse*).

107. APIS INDICA, Fabr.

Apis indica, Fabr., Ent. Syst., Suppl., p. 274.

Lahej (*Capt. Nurse*).

ON SOME NEW SPECIES OF INDIAN *HYMENOPTERA.*

By Lieut.-Col. C. T. Bingham, F.Z.S., F.E.S.

(*Vide Plate A.*)

(*Read before the Bombay Natural History Society on 28th Feb.*, 1898).

In the review in *Nature* on Volume I of my "Hymenoptera of India," issued as one of the "Fauna of India" series, the writer remarked that close on one thousand species of wasps and bees are described in that volume, and stated that probably more than two thousand species would ultimately be found within the limits treated of in my work. This forecast seems more than likely to come true. In a collection of Hymenoptera recently made at Deesa and at Simla by Captain C. Nurse, and kindly sent to me to work out, I find among the bees and wasps alone no less than 23 species new to the Indian fauna, out of which number, so far as I can make out, 22 species have not hitherto been described.

I give below a description of these as well as of a few presumably new species of *Tenthredinidæ*, *Ichneumonidæ*, and *Chrysididæ*, received some from Mr. F. Möller, of Tukvar, Darjiling, and some with the bees and wasps collected by Captain C. Nurse in Simla and Deesa. My best thanks are due to both these gentlemen for their kind loan as well as presents of collections.

Family Tenthredinidæ, Leach.

1. *Allantus incognitus*, sp. n.

♂. Head above and thorax finely and closely punctured granular; abdomen smooth and shining; clypeus smooth, emarginate at apex, the emargination rounded and ending in acute teeth one on each side. Black, the labrum, the base of the mandibles, large lateral spots on the clypeus, the posterior angles of the pronotum, the apex of the scutellum, a spot above the posterior coxæ on each side, the anterior femora and tibiæ in front, and a broad line widening laterally at the base of the abdomen, lacteous-white; the apex of the posterior femora, the posterior tibiæ, and the apical margins above of the 3rd to the 5th abdominal segments ferruginous-red; wings hyaline, the front wing anteriorly stained with dark fuscous, the tegulæ and nervures brown.

♂. *Length* 11; *exp.* 22 mm.

Hab. Simla.

Allied to *Allantus simillimus*, Smith, but is abundantly different.

Family Ichneumonidæ, Leach.

2. *Coleocentrus möllerii*, sp. nov., pl. A, figs. 4, 4a, 4b.

♀. Head with a few shallow punctures on the vertex ; antennæ long, filiform, the scape swollen, deeply emarginate on the outer side, the joints of the flagellum oblique at their apices ; mesonotum oval, convex, transversely plicated and rugose, scutellum punctured, postscutellum very small, compressed ; median segment flat on the sides, rounded posteriorly, and obliquely sloped to the apex ; abdomen shining, the basal two segments impunctate above, the remainder finely punctured at base above ; basal segments depressed, flattened, apical segments sub-compressed ; the ovipositor long, longer than the rest of the head and body united, emitted from the apical segment, which with the next three segments, looked at from the ventral side, are ensheathed one within the other. Black, the clypeus, the face below the base of the antennæ, a spot on each side above the latter, the front of the scape, the cheeks, the pronotum in front and on its posterior lateral angles, two abbreviated parallel longitudinal lines on the disc of the mesonotum, the tegulæ, the mesopleuræ, the base of the scutellum, a spot on each side of it, the whole of the median segment, a large spot on the metapleuræ, the front of the coxæ, trochanters and femora, and the whole of the tibiæ and tarsi of the anterior legs, a spot on the coxæ, another on the basal joint of the trochanters posteriorly, a line on the outer side of and the apical one-third of the femora, and apical half of the tibiæ of the intermediate legs, a spot on the coxæ, another on the basal joint of the trochanters posteriorly, the apical half of the femora and the middle of the tibiæ of the posterior legs, and sub-apical bands on all but the apical abdominal segment above, yellow ; the bands on the 4th and 5th segments are widened laterally, while that on the 6th segment forms a transverse diamond-shaped spot ; ovipositor and tarsi reddish-brown ; wings deep brownish-yellow, nervures dark brown.

♀. *Length* 33, *of ovipositor* 51 ; *exp.* 64 mm.

Hab. Sikhim ; Tenasserim.

3. *Xylonomus elizabethæ*, sp. nov., pl. A, figs. 5, 5a.

♀. Head smooth, polished and shining ; antennæ filiform ; thorax rugose, the mesonotum long and oval, the parapsidal grooves deeply marked ; median segment rounded posteriorly, rugose, with four irregularly-waved longitudinal carinæ, the inner two of these reaching the apex of the segment and ending in a well-marked tooth ; tibiæ of the anterior and intermediate legs constricted at base ; basal abdominal segments sub-depressed, the 2nd and 3rd marked above with V-shaped depressions, apical segment sub-compressed. Dark shining blue, a broad stripe on each side of the face, interrupted by the scape of the antennæ, white ; the anterior four legs, the base of the coxæ, the trochanters, femora, tibiæ and tarsi, except at their apex, the base and a band across the 1st abdominal segment, a band across the 2nd, and the apical margins above narrowly of the 3-5 segments, honey-yellow ; antennæ black, the 10-16 and the apical four joints of the flagellum white ; the apex of the posterior coxæ, femora and tibiæ, and the claw-joint of the tarsi of all the legs black ; ovipositor black, the side sheaths with a broad sub-apical ring white ; wings hyaline, a fuscous spot on the forewing at the junction of the radial with the cubital cells, tegulæ and nervures testacious.

♀. *Length* 17, *of ovipositor* 13 ; *exp.* 27 mm.
Hab. Sikhim, 1,000 to 4,000 feet.

Family CHRYSIDEDÆ, Leach.

4. *Chrysis cupreiventris*, sp. nov.

♀. Head, thorax, and abdomen densely and rather coarsely punctured, granular ; eyes slightly convergent below, front broad, with a fine T-shaped carina between the eyes ; abdomen with a medial longitudinal carina on the 2nd and 3rd segments above, 3rd segment ending in four well-marked dentations with a row of six sub-apical fovea above the dentations ; head and thorax brilliant steel-blue, the face below the base of the antennæ, the posterior margin of the pronotum, the tegulæ, borders of the thorax above, the sides beneath the wings, the pectus and the coxæ, femora and tibiæ of the leg, golden-green ; the antennæ and the tarsi black, the scape of the former golden-green above ; the clypeus, front cheeks, and sides of the thorax covered with somewhat long, soft, white pubescence ; abdomen coppery-red, the 2nd segment above in the middle steel-blue, abdomen beneath blue-green, the 2nd segment with a large lateral rounded spot at base ; wings hyaline, slightly fuscous on the disc of the forewing, nervures dark brown.

♀. *Length* 10 ; *exp.* 21 mm.
Hab. Simla.

Nearest to *C. zobeida*, Du Buyss, of which it may be an extreme variety; but it is apparently distinct from a specimen of *C. zobeida* from Aden given me by Colonel Yerbury.

Family MUTILLIDÆ, Leach.

5. *Mutilla fumipennis*, sp. nov., pl. A.f. 6.

♂. Head and thorax somewhat coarsely punctured, the clypeus, front sides of the face, cheeks, sides of the pronotum and median segment above with dense matted pubescence, the front above the base of the antennæ raised, tuberculate, giving to the face close to the lower portion of the inner orbits and the sides of the clypeus an appearance of being hollowed out, a short vertical carina from the anterior ocellus not reaching the base of the antennæ ; mesonotum with two medial longitudinal furrows, scutellum excavate at base, produced posteriorly into a cone, the apex tuberculate, shining; median segment strongly depressed, with the sides somewhat flat, above meeting along the medial line of the segment at an angle and forming a well-marked longitudinal carina ; legs and abdomen thinly pubescent, the 2nd segment of the latter finely and evenly punctured above, the remaining segments obsoletely punctured towards their apical margins, apical segment with a faintly defined medial longitudinal carina, 1st ventral segment with a highly raised longitudinal carina forming a thin sub-triangular plate the anterior edge of which is deeply emarginate. Black, the pubescence silvery, forming a broad medially interrupted band on the apical margin of the 2nd abdominal segment, the 1st and basal four-fifths of the 2nd segment of the abdomen red ; wings, basal half of forewing deep yellow, of hind wing clear hyaline, apical portions of both wings deep fuscous, tegulæ black, very large, smooth and shining, nervures yellow on the yellow or hyaline and fuscous on the dark portions of the wings.

♂. *Length* 12 ; *exp.* 21 mm.

Hab. Deesa.

Family POMPILIDÆ, Leach.

6. *Pseudagenia glabra*, sp. nov.

♀ ♂ Head, thorax, and abdomen smooth, brilliantly polished and shining, entirely impunctate; clypeus transverse, slightly convex, its anterior margin straight ; mesonotum wide, convex ; median segment rounded posteriorly with a gentle slope to the apex, which is emarginate ; abdomen narrow, about the length of the head and thorax united. Jet black, the clypeus and sides of the face with dense, he sides of the thorax and of the median segment with short, thin, silvery pubescence; wings hyaline, tegulæ and nervures black.

♀. *Length* 9 ; *exp.* 18 mm.

♂. *Length* 5-9 ; *exp.* 11-20 mm.

Hab. Simla, Sikhim.

7. *Pompilus deperditus*, sp. nov.

♀. Head, thorax, and abdomen smooth, shining, and entirely impunctate in certain lights, with a fine silky pruinose look, head not quite so wide as the thorax ; clypeus convex, transversely truncate anteriorly, labrum extended, well marked ; eyes with the inner orbits slightly arched outwards in the middle, front and vertex broad, rounded, steeply sloping back to the occiput, this latter emarginate posteriorly ; pronotum somewhat long, anteriorly rounded, posteriorly emarginate ; median segment with the sides slightly bulging, flattened, above rounded, the apex depressed, gently emarginate ; abdomen massive, slightly longer than the head and thorax united. Black, the clypeus, sides of the face, cheeks, sides of the thorax and of the median segment and the base of the segments of the abdomen in certain lights covered with a thin plumbeous bloom ; wings hyaline with light fuscous clouds along the basal nervure, in the radial, 2nd cubital and 2nd discoidal cells of the forewing, and along the apical margins broadly of both wings, nervures and tegulæ black.

♀. *Length* 11-12 ; *exp.* 22 mm.

Hab. Simla.

Somewhat resembles *P. limbatus*, Smith, but apart from the colour of the wings, it differs from the latter in the much more massive and longer prothorax, in the median segment not bearing a medial longitudinally impressed line, and in the inner calcar of the hind tibiæ being short, only about half the length of the metatarsus. In *P. limbatus* this calcar very nearly equals the metatarsus in length.

Family SPHEGIDÆ, Leach.

8. *Tachytes hospes*, sp. nov., pl. A, f. 7.

♀. Head and thorax anteriorly smooth, median segment rounded above, truncate posteriorly, not so long as the thorax, bearing a medial slightly marked longitudinal furrow from which fine divergent striæ radiate obliquely backwards, curving over the sides ; abdomen massive, smooth, dull and opaque, with only a few fine scattered punctures; pygidial area densely pubescent; head, thorax, the coxæ and trochanters of the legs, and the median segment, black; the femora, tibiæ and tarsi, and the abdomen dull deep red; the clypeus, the face in front as high nearly as the vertex, the cheeks, the pronotum, the mesonotum, except on the disc, the sides of the thorax and pectus, the back of the anterior femora and the front of the coxæ, the sides of the scutellum, the postscutellum, and the sides and apex of the median segment, covered with a dense matting of fine short silvery pile, the pygidial area with golden pile; wings fusco-hyaline, their apical margins darker, tegulæ and nervures red.

♀. *Length* 20; *exp.* 32 mm.

Hab. Deesa.

9. *Cerceris himalayensis*, sp. nov.

♂. Head, except the clypeus and the region immediately round the ocelli, thorax and abdomen closely and somewhat coarsely punctured and granular; clypeus smooth, shining, highly polished, convex almost circular, its anterior margin not dentate, cordate, space at the base of the median segment longitudinally striate, remainder of segment coarsely punctured, the punctures running into irregular striæ on the sides; abdomen long, longer than the head and thorax, basal segment narrowed, 2-4 segments strongly, 5th segment slightly, constricted at base, 5th and 6th ventral segments with prominent well-marked lateral teeth on their apical margins. Black, the mandibles except at apex, the clypeus and face to a little above the base of the antennæ, the scape of the latter in front, a large spot on each side on the posterior margin of the pronotum, the postscutellum, the greater part of the legs, and transverse bands emarginate in the middle above on the apical margins of 1-6 abdominal segments, yellow, the basal three joints of the flagellum of the antennæ, the apical three joints of the tarsi of the intermediate legs, the apex of the femora, the tibiæ and tarsi of the posterior legs, and the lateral dentate processes on the 6th abdominal segment, ferruginous, the apex of the mandibles and a mark on the femora of all the legs posteriorly black; wings hyaline, fuscous at apex and along the outer margin, the costal margin of the forewing stained deep yellow, tegulæ and nervures yellow.

♂. *Length* 11; *exp.* 20 mm.

Hab. Simla.

10. *Crabro grassator*, sp. nov.

♂. Head broad, broader than the thorax front, vertex, pro- and mesonotum finely and very closely punctured, with an opaque and somewhat granular appearance, scutellum, postscutellum, and median segment more coarsely punctured, the last with a medial deep transversely striate and somewhat broad furrow, meeting in T-fashion a furrow running between the postscutellum and median segment; abdomen smooth, polished, elongate, oval in shape, the basal segment gradually broadening from base to apex. Black, the base of the mandibles, the scape of the antennæ in front, a medially interrupted line on the posterior margin of the pronotum, the tubercles, the greater part of the legs, and ovate spots at the base of the 2nd, 4th, and 5th abdominal segments above yellow, the spots on the latter two segments having a greenish tinge; the clypeus, which is sub-porrect, and front of the face covered with dense silvery pile, the coxæ and greater part of the femora of the legs black, the tarsi stained ferruginous; wings hyaline, lightly sub-fuscous, nervures and tegulæ dark brown.

♂. *Length* 9; *exp.* 16 mm.

Hab. Simla.

Closely allied to *C. odontophorus*, Cam., and *C. ardens*, Cam., but differing from both in markings, and very conspicuously in structure and sculpture.

Family Eumenidæ, Westro.

11. *Eumenes antennata*, sp. nov., pl. A, f. 8.

♂. Vertex of the head, the mesonotum, the petiole of the abdomen, and 2nd abdominal segment above coarsely punctured, remainder of the head, thorax, and abdomen smooth but dull and opaque in appearance; clypeus elongate scutiform, deeply emarginate at apex; scape of the antennæ very thick and massive; petiole of abdomen narrowed at base, sub-tuberculate on the middle laterally. Black, the mandibles, clypeus, face in front, the emargination of the eyes, a line behind them, the scape of the antennæ, the pronotum, two crescentic spots anteriorly on the mesonotum, two smaller quadrate spots on the same in the middle, the scutellum, a line posteriorly on the postscutellum, the whole of the median segment, except a small triangular spot at its base, the mesopleuræ, the legs, two spots at the base, two laterally on the middle and the apex broadly of the petiole, and the greater part of the rest of the abdomen yellow ; the back of the femora, apex of the tibiæ, and the tarsi of the posterior legs reddish-brown, the base narrowly, and a transversely elongate diamond-shaped spot on the 2nd abdominal segment above, with the bases of the 3-6 segment and the whole of the apical segment black ; the apical three joints of the flagellum of the antennæ reddish-yellow ; wings hyaline, tegulæ yellow, nervures testaceous, the clypeus covered with silvery pile, very bright and glistening in certain lights.

♂. *Length* 10; *exp.* 18 mm.

Hab. Deesa.

12. *Odynerus nursei*, sp. nov., pl. A, f. 9.

♀. Head and front above the base of the antennæ very finely and closely punctured ; clypeus nearly circular, very convex, smooth and dull, with only a few scattered fine punctures, the anterior margin bent downwards and produced slightly into two teeth ; thorax oval above, on the sides somewhat finely and distantly, and on the postscutellum and median segment above very densely and coarsely punctured ; disc of mesonotum with two parallel longitudinally impressed lines ; median segment posteriorly truncate, the face of the truncation smooth ; legs smooth, shining, slightly pruinose in certain lights ; abdomen highly polished and shining, the basal segment and base of the 2nd coarsely and cribrately punctured and rugose, the former narrowed at base, anteriorly abruptly truncate, with a transversely impressed furrow along the margin of the truncation, remaining abdominal segments lightly punctured ; the 1st ventral segment coarsely reticulate, the margin smooth ; base of the 2nd ventral segment depressed, bearing coarse longitudinal striæ with deep furrows between, the remainder of this and the following ventral segments highly polished, smooth, and shining. Black, a crescentic spot at the base of the clypeus, a spot on each side on the pronotum, a spot beneath the base of the wings, the apical margins of the 1st narrowly, of the 2nd broadly above and on the sides, and of the 3rd and 4th abdominal segments narrowly in the middle above, yellow, legs black ; the apex of the femora, the tibiæ and tarsi testaceous-brown, the tibiæ of the intermediate and posterior legs with a black stain on the underside ; wings light fusco-hyaline, nervures and tegulæ reddish-brown.

♀. *Length* 12 ; *exp.* 20 mm.

Hab. Simla.

Family Apidæ, Auct.

13. *Sphecodes indicus*, sp. nov., pl. A, f. 10.

♂. Head closely and finely punctured ; antennæ elongate ; somewhat moniliform ; thorax anteriorly shining sparsely ; the median segment densely and very coarsely punctured, the punctures running into reticulations, the segment rounded above, the apex truncate, and margined and bearing a medial longitudinal carina ; legs and abdomen smooth, polished and shining, rather finely and delicately punctured, a constriction between the 1st and 2nd segments of the latter, with the margin of the 2nd segment depressed. Jet black, the front, the clypeus, cheeks, sides of the thorax beneath wings, and the legs covered with a thin silvery-white pubescence, most dense on the clypeus and front of the head below the base of the antennæ, very sparse on the legs, where on the tarsi it turns into a ferruginous-brown colour ; wings hyaline at base, sub-fuscous on their apical two-thirds, nervures and tegulæ black.

♂. *Length* 7 ; *exp.* 15 mm.

14. *Halictus asperatus*, sp. nov.

♀. Head above, thorax and abdomen very minutely and densely punctured ; the face on each side of the clypeus and along the inner orbits to as high as the base of the antennæ rugosely striate, the striæ irregular and obliquely divergent ; clypeus finely and somewhat sparsely punctured, anteriorly transverse ; median segment short, abruptly truncate posteriorly ; the cordate space at base broad, concave, and with fine oblique divergent striæ ; abdomen massive, longer than the head and thorax united. Black, the apical margins of the basal three abdominal segments reddish-brown ; the head, thorax, legs and transverse narrow bands, on the apical margins of the 1-4 segments of the abdomen, with hoary-white pubescence ; the pubescence inclines to fuscous on the head and face in front, is very bright and glittering with a yellow tinge on the legs, and is snow-white on the abdomen ; anal rima reddish-brown, with a fringe on each side of fuscous hairs ; wings hyaline, very faintly fuscous on their apical margins, the tegulæ and nervures brown.

♀. *Length* 11 ; *exp.* 23 mm.

Hab. Simla.

This large and handsome species can be easily distinguished by its remarkably rugose face.

15. *Halictus dynastes*, sp. nov.

♀. Head above and in front to the base of the antennæ very finely punctured, the punctures seeming to run into striæ in certain lights; clypeus and median segment more distantly and coarsely punctured; abdomen above finely aciculate; median segment rounded posteriorly, with the cordate space at base concave, and with fine divergent striæ. Black, the pubescence on the head and thorax fuscous, on the legs pale and glittering, and on the abdomen hoary-white, forming a narrow transverse band at the base of the 2nd and 6th segments, and a very broad and conspicuous one at the base of the 3rd segment, anal rima reddish-brown, fringed with fuscous hairs on each side; wings very broad and ample, hyaline, tegulæ black, nervures brown.

♀. *Length* 10; *exp.* 21 mm.

Hab. Simla.

Resembles *H. ducalis*, Bingh., but the median segment is rounded, not truncate posteriorly, the cordate space at its base being striated, not punctured, and the broad band of pubescence is at the base of the 3rd, not the 2nd abdominal segment.

16. *Halictus nireus*, sp. nov.

♂. Head, thorax, and abdomen polished and shining, extremely minutely punctured, the punctures on the face in front seeming, in certain lights, to run into very fine longitudinal striæ; median segment roundly truncate posteriorly, the cordate space at base reticulate; abdomen with the apical margins of the basal two segments distinctly depressed. Jet black, thinly covered with a short pale pubescence all over, most dense on the femora, tibiæ, and tarsi of the legs; the apical margins of all the abdominal segments, and the tibiæ and tarsi of the legs, testaceous; wings hyaline, nervures and tegulæ pale testaceous.

♂. *Length* 8-9; *exp.* 17 mm.

Hab. Simla.

17. *Halictus himalayensis*, sp. nov., pl. A, f. 11.

♀. Head and thorax in front closely and very finely punctured; median segment rounded, slightly truncate posteriorly, the cordate space at its base depressed, bearing divergent fine oblique striæ; abdomen massive, smooth, and shining; head and thorax black; the greater part of the abdomen blood-red; the face in front, the sides of the thorax, the sides and apex of the median segment, and the legs covered with somewhat dense glittering pale yellow pubescence, forming a tuft on the tubercles, and specially dense on the femora and inside of the tibiæ of the posterior legs; the base of the 1st and the apical two segments of the abdomen blackish, the anal rima pale testaceous; wings hyaline, tegulæ and nervures testaceous.

♀. *Length* 7; *exp.* 14 mm.

Hab. Simla, Mussoorie, Sikhim.

18. *Nomia tegulata*, Smith.

Nomia tegulata, Smith, Trans. Ent. Soc. 1875, p. 69.

An Arabian and African species not previously recorded from India. Specimens vary somewhat in size and in the colour of the tegulæ, but can be easily distinguished from all others by the remarkably large development of the latter. I give Smith's original description:—

"Female.—Length 2½ to 3¼ lines. Black and thinly covered with short cinereous pubescence, that on the tarsi and posterior tibiæ pale fulvous. Head: the flagellum fulvous beneath towards the apex; the clypeus rather strongly and closely punctured. Thorax: the metathorax smooth with the sides punctured. Wings hyaline with their apical margins clouded, the nervures testaceous, the tegulæ large and pale testaceous, having anteriorly a rufo-fuscous spot; the posterior tibiæ and all the tarsi pale ferruginous; abdomen, at the basal margins of the segments a fascia of pale pubescence, over which is a thin fringe of pale fulvous hairs on the apical margins."

Hab. Sierra Leone, Aden, Deesa.

Specimens vary in length from 2½—4¼ lines (6—9 mm.) and in the colour of the tegulæ from white to dark testaceous-yellow.

19. *Megachile creusa*, sp. nov.

♀. Head, thorax, and the bases of the abdominal segments strongly but finely punctured; head very large and massive, broader than the thorax, emarginate posteriorly; clypeus slightly convex, broader than high, its anterior margin transverse; median segment very short, smooth, and impunctate at base; abdomen about as long as the head and thorax united; the apical margins of segments 2—5 strongly depressed, the anterior border of the depressed bands bisinuate. Black, the flagellum of the antennæ, and the femora, tibiæ, and tarsi of all the legs dark blood-red; the front and clypeus, sides of the thorax and of the median segment, covered with long, the margins of the abdominal segments 1-5 with short, white pubescence; pollen brush fuscous-white, wings hyaline, shaded with fuscous on the apical half of the forewing, nervures and tegulæ brownish-red.

♀. *Length* 12; *exp.* 23 mm.

Hab. Deesa.

20. *Megachile cœlioxysides*, sp. nov.

♀. Head, thorax, and abdomen extremely, minutely, and closely punctured and densely pubescent, the pubescence soft and short on the abdomen, forming apical bands on segments 1—5; head about as broad as the thorax; clypeus broad, convex, its anterior margin transverse, notched in the middle; abdomen tapering sharply from base to apex, as in the genus *Cœlioxys*. Black, the pubescence snow-white, ferruginous on the inside of the metatarsus of the posterior legs, antennæ castaneous, claws pale testaceous; pollen brush snow-white; wings hyaline, nervures and tegulæ testaceous.

♀. *Length* 10; *exp.* 17 mm.

Hab. Deesa.

21. *Megachile studiosa*, sp. nov.

♀. Head, thorax, and abdomen finely, evenly, and somewhat closely punctured; the clypeus and front, the cheeks, sides of the thorax, sides of the median segment and legs clothed with long soft pubescence; clypeus much broader than high, slightly convex, its anterior margin transverse or even slightly emarginate; abdomen strongly convex above the 3rd and 4th segments, with a conspicuous transversely-impressed line above, posterior to which on the 4th segment the surface is smooth, shining, impunctate. Black, the pubescence snow-white, ferruginous on the inside of the posterior tarsi; pollen brush snow-white; wings hyaline, nervures and tegulæ black.

♀. *Length* 9; *exp.* 17 mm.

Hab. Simla.

The latter two species somewhat resemble each other at first sight; but apart from the difference of the puncturing, the remarkable shape of the abdomen of *M. cœlioxysides* distinguishes it at once from *M. studiosa*, and in fact from any species of *Megachile* known to me.

22. *Anthidium desidiosum*, sp. nov., pl. A, f. 12.

♀. Head and thorax dull opaque, looking densely and very finely punctured, and covered with somewhat long sparse pubescence;

abdomen more finely but not quite so densely punctured, non-pubescent and slightly shining; all the abdominal segments with their apical margins very narrowly smooth and polished. Black, the clypeus, the sides of the face, a transverse line on the occiput broadened at each end, the margins of the tegulæ, the posterior margins very narrowly of the scutellum, the tibiæ anteriorly, and the tarsi of the legs, and elongate spots on each side at the base of all the abdominal segments above yellow, the pubescence fuscous, the pollen-brush yellowish-white; wings hyaline, broadly fuscous along their apical margins.

♀. *Length* 10; *exp.* 21 mm.

Hab. Deesa.

23. *Ceratina incognita*, sp. nov.

♂. Head and thorax finely and closely, abdomen more coarsely, punctured, shining; the clypeus, the disc of the mesonotum and of the scutellum nearly impunctate, polished; median segment rounded posteriorly; the lunate space at base concave, coarsely punctured and rugose. Black, the clypeus, the tubercles, the knees and the tibiæ anteriorly of all the legs; elongate lateral spots on abdominal segments 2—4, smaller lateral spots on segments 1 and 5, and two spots medially above on the apical margin of the 1st segment above, reddish-yellow or orange; tarsi testaceous-yellow; wings hyaline; nervures and tegulæ dark brown.

♂. *Length* 8; *exp.* 16 mm.

Hab. Simla.

24. *Anthophora liriope*, sp. nov.

♂. Head, thorax, and abdomen covered with dense long pubescence, forming on the last broad transverse bands on the apical margins of segments 1—5; clypeus sub-porrect, with a deep square emargination anteriorly, the vertex of the head and the base of all the segments of the abdomen densely punctured. Black, the base of the mandibles, the labrum, and the clypeus whitish-yellow; the margins of the labrum and of the clypeus, and the apex of the mandibles, testaceous-brown, the sides of the clypeus towards the base black, the antennæ castaneous, the pubescence on the vertex, on the thorax above, and on the posterior lateral angles above, of the median segment, ochraceous, that on the clypeus, cheeks, thorax beneath, on the outside of the anterior legs, on the outside of the coxæ, femoræ, tibiæ, and metatarsi of the intermediate and posterior legs, and the transverse bands on the abdomen, snow-white ; on the inside of the legs and on the apical joints of the intermediate and posterior tarsi is jet black in conspicuous contrast ; wings hyaline, with an exceedingly pelucid glassy look, nervures and tegulæ testaceous.

♂. *Length* 10 ; *exp.* 19 mm.

Hab. Deesa.

25. *Anthophora iole*, sp. nov.

♂. Allied to and closely resembling the last but structurally different ; head on the vertex above and the bases of all the abdominal segments extremely, minutely, and closely punctured, the puncturing much finer than in the preceding species ; clypeus convex, sub-porrect, its anterior margin transverse not emarginate. Black, the labrum, clypeus, the face on either side and above below the base of the antennæ, and the scape of the last in front, pearly-white ; two spots at the base of the labrum ; a broad oblique line on each side of the clypeus, and the margins narrowly both of the clypeus and labrum, black ; the back of the scape and the flagellum of the antennæ dark castaneous ; the head above the base of the antennæ, the thorax above the median segment, and the basal abdominal segments clothed with dense long ochraceous pubescence, with the tips of the hairs fuscous-black ; the cheeks, pectus, sides of the thorax, legs on the outside, and abdomen with dirty fuscous-white pubescence, which on the abdomen forms somewhat thin but broad transverse bands on the apical margins of segments 2—5, the inside of the legs, especially the inside of the posterior metatarsi, clothed with dense black pubescence ; wings hyaline, nervures and tegulæ brown.

♂. *Length* 10 ; *exp.* 20 mm.

Hab. Simla.

26. *Anthophora antiope*, sp. nov.

♀. Head, thorax, and abdomen finely and closely punctured, pubescent ; clypeus convex, subporrect, anteriorly roundly emarginate, front below the ocelli depressed, a conspicuous medial vertical carina from the anterior ocellus to the apex of the clypeus ; anal segment of the abdomen raised and flat above, compressed at the sides. Black, the pubescence on the front, the sides of the thorax, the median segment, and base of 1st abdominal segment, fuscous-white, on the cheeks, pectus, legs in front, and abdomen it is snow-white, forming on the last narrow transverse bands above and below on segments 1—5, pubescence on the tarsi, and the tibial calcaria and apical joints of the tarsi, castaneous ; wings hyaline, tegulæ testaceous, nervures dark brown.

♀. *Length* 16; *exp.* 28 mm.

Hab. Simla.

27. *Apis testacea*, sp. nov.

♀. Head, thorax, and abdomen smooth, dull, impunctate, covered on the head and thorax with a very thin sparse pubescence ; clypeus very slightly convex, its anterior margin truncate, front with a conspicuous medial furrow from the base of the antennæ to below the anterior ocellus, where it forks and passes in Y-fashion to behind the posterior ocelli ; median segment rounded posteriorly, with a medial longitudinal furrow ; abdomen massive, longer than the head and thorax united; head, flagellum of the antennæ, except the basal joint, and the whole of the thorax and median segment, castaneous brown ; the scape and basal joint of the flagellum of the antennæ, the legs and the abdomen, pale honey-yellow, the whole insect having a pelucid semi-transparent appearance, pubescence snow-white ; wings hyaline, vitreous, tegulæ and nervures honey-yellow.

♀. *Length* 9; *exp.* 8 mm.

Hab. Deesa.

Knowing the extreme variability of the three common species of honey bees found in India, it is with no little hesitation I describe and figure this remarkable form sent me by Captain Nurse. It is so different from any specimen of *Apis indica* or of *A. florea* that I have ever come across that I venture to describe it as new. It is to be hoped that Captain Nurse will be able to find a comb of the species, and procure the queen and the drones.

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EXPLANATION OF PLATE A.

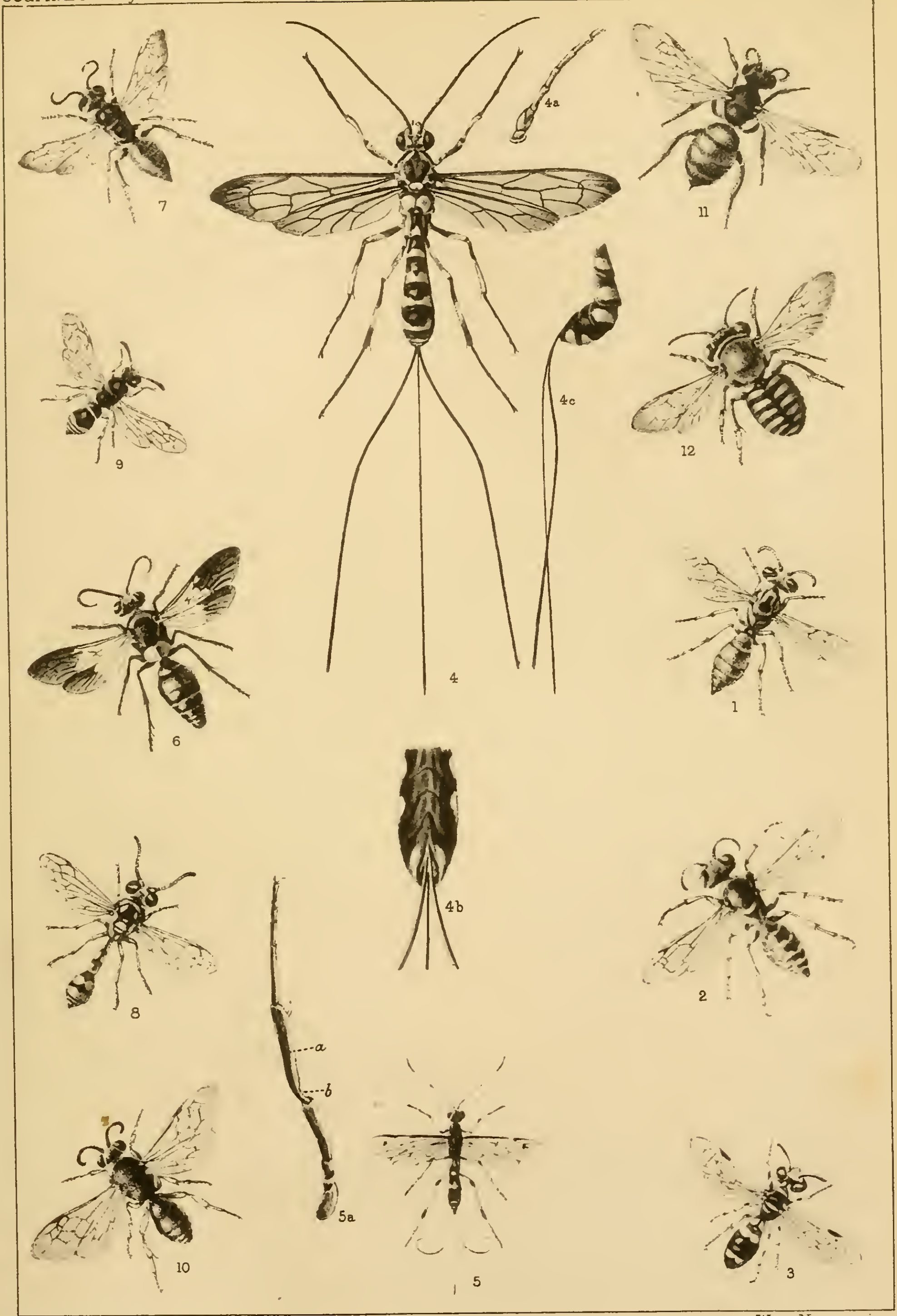
(*a*) Aden Hymenoptera.

Trachypus subconcolor, sp. nov.	Fig.	1,	p. 107.
Philanthus yerburyi, sp. nov.	,,	2,	p. 106.
Trachypus nursei, sp. nov.	,,	3,	p. 108.

(*b*) Indian Hymenoptera.

Coleocentrus möllerii, sp. nov.	,,	4,	p. 116.
,, ,, view underside of last four abdominal segments	,,	4*a*,	p. 116.
,, ,, basal 4 or 5 joints of the antenna	,,	4*b*,	p. 116.
Xylonomus elizabethæ, sp. nov.	,,	5,	p. 116.
,, ,, foreleg showing attenuated base	,,	5*a*,	p. 116.
Mutilla fumipennis, sp. nov.	,,	6,	p. 118.
Tachytes hospes, sp. nov.	,,	7,	p. 119.
Eumenes antennata, sp. nov.	,,	8,	p. 121.
Odynerus nursei, sp. nov.	,,	9,	p. 122.
Sphecodes indicus, sp. nov.	,,	10,	p. 123.
Halictus himalayensis, sp. nov.	,,	11,	p. 124.
Anthidium desidiosum, sp. nov.	,,	12,	p. 126.

Plate A.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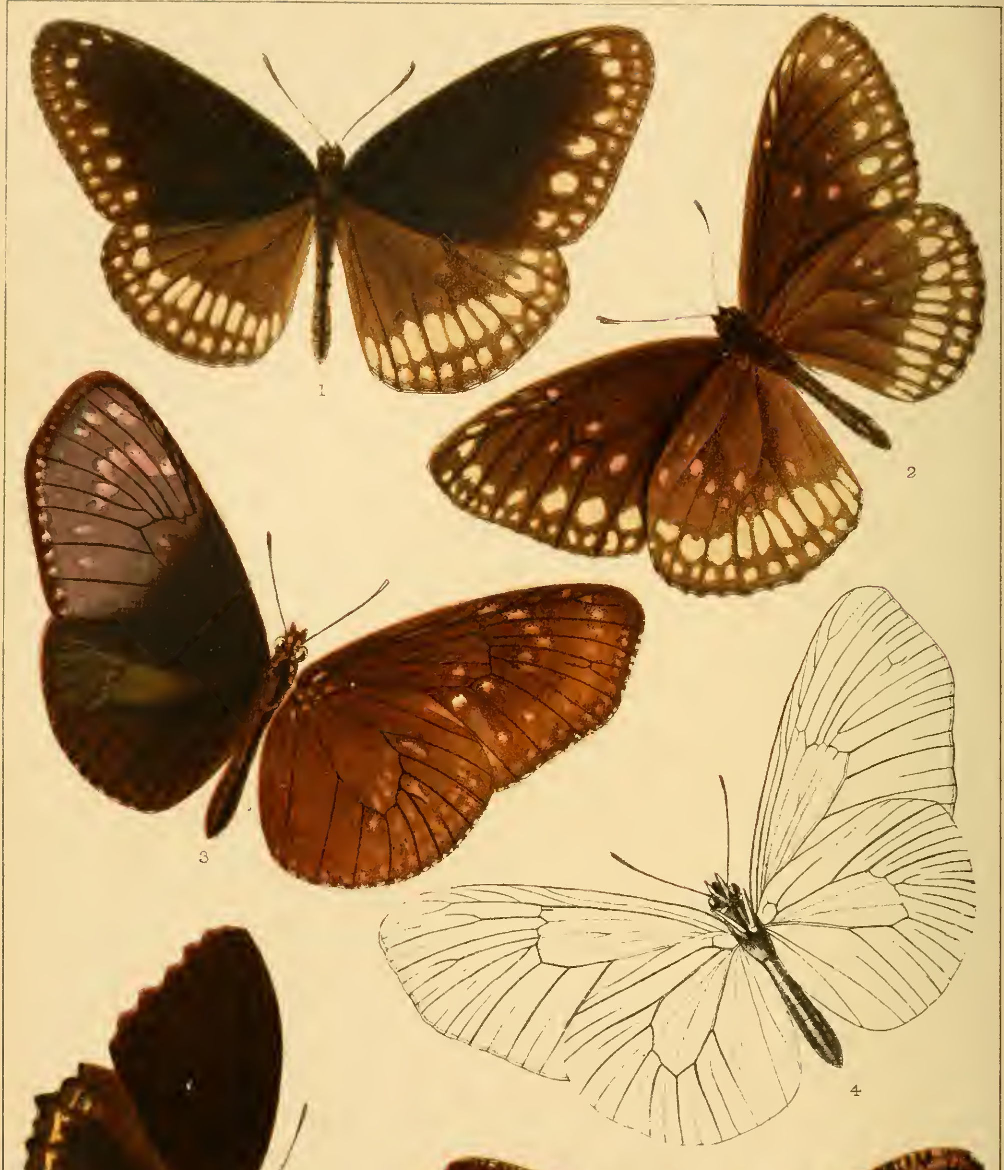
B.L. Dós, del. Calcutta.
West Newman imp

INDO-MALAYAN HYMENOPTERA.

de NICÉVILLE, Journ. Bomb. Nat. Hist. Soc. Vol XII. Plate X.



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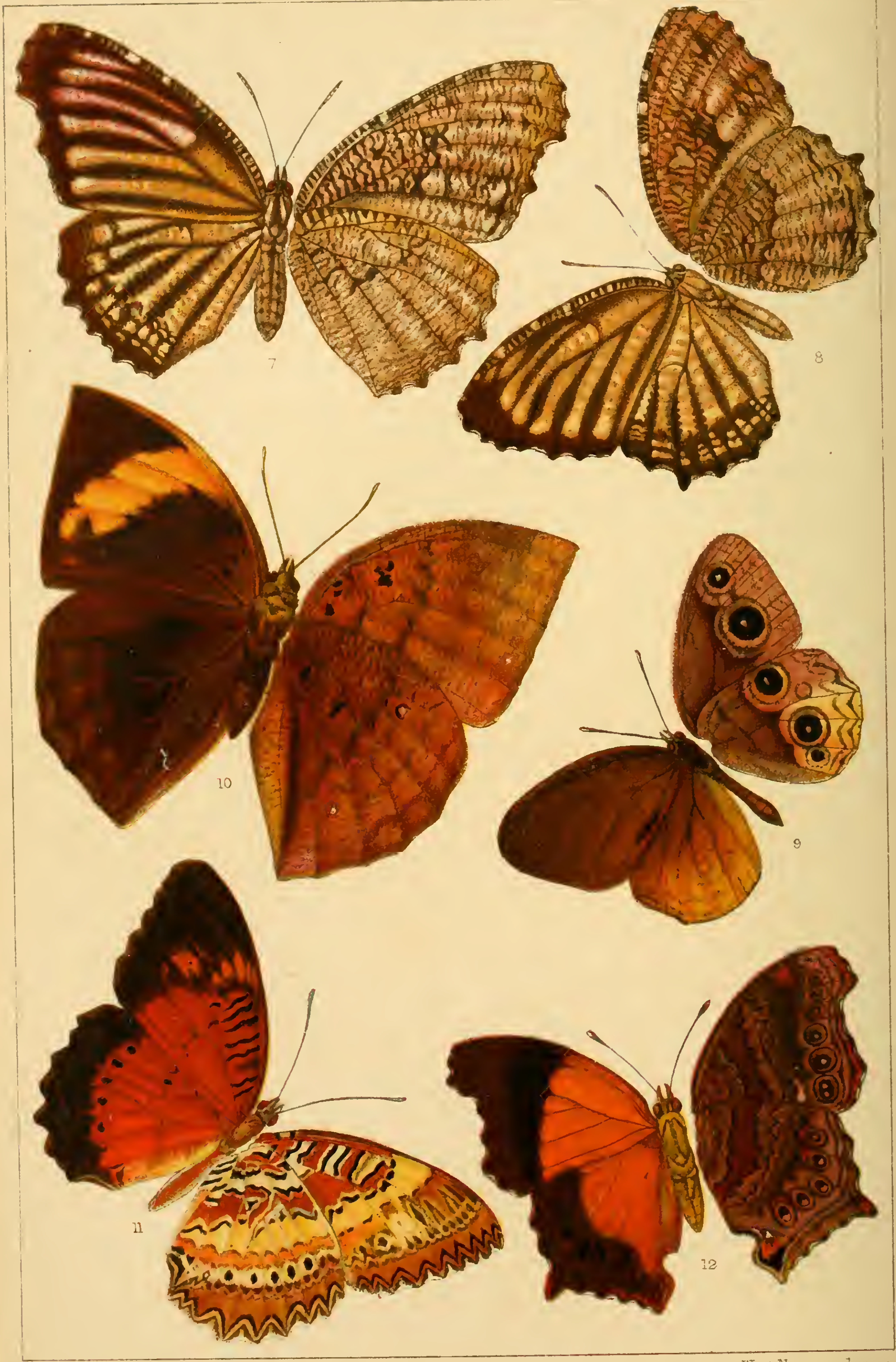
EASTERN BUTTERFLIES.

L. de NICÉVILLE, Journ. Bomb. Nat. Hist. Soc. Vol. XII



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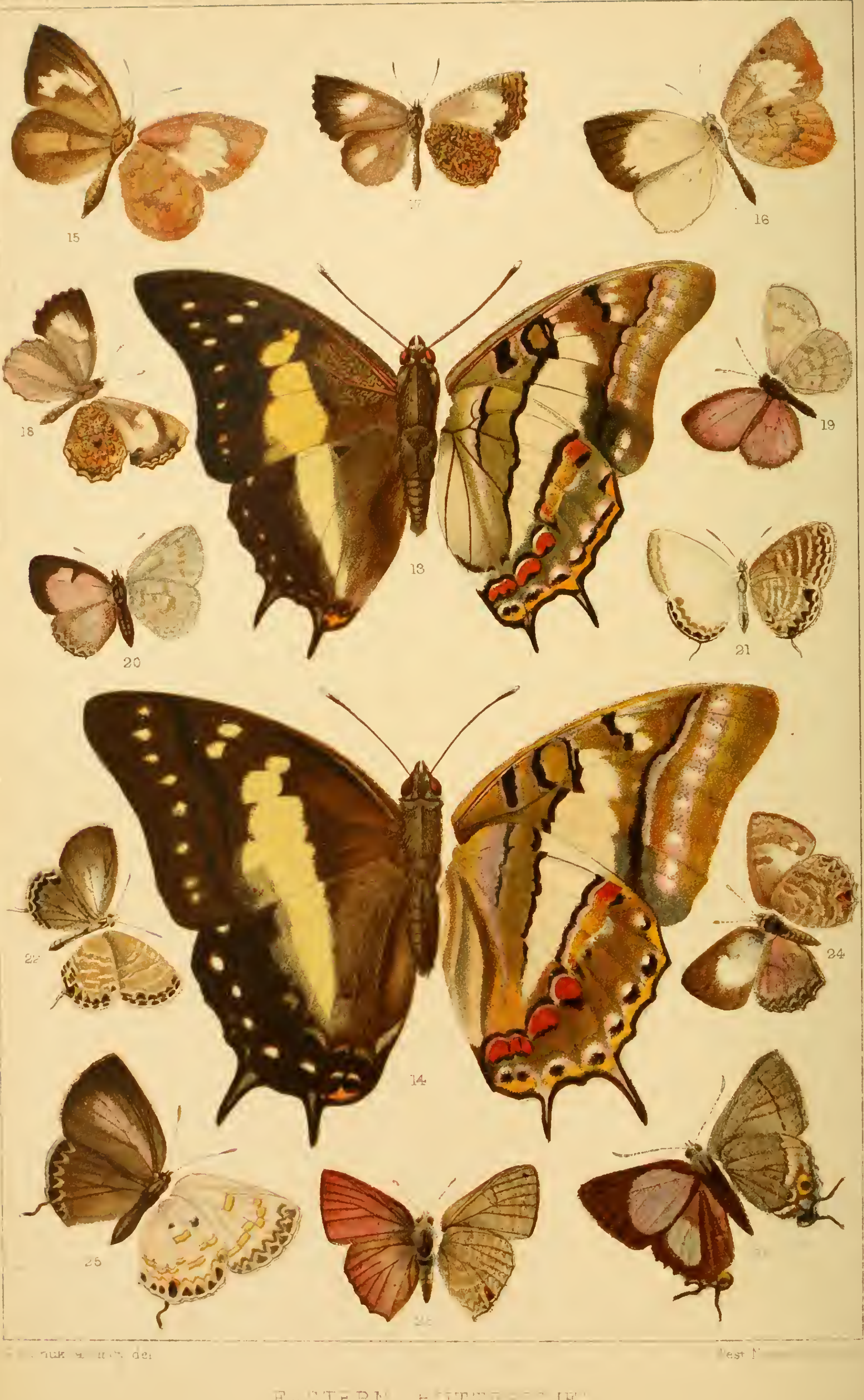
West, Newman chromo.

EASTERN BUTTERFLIES.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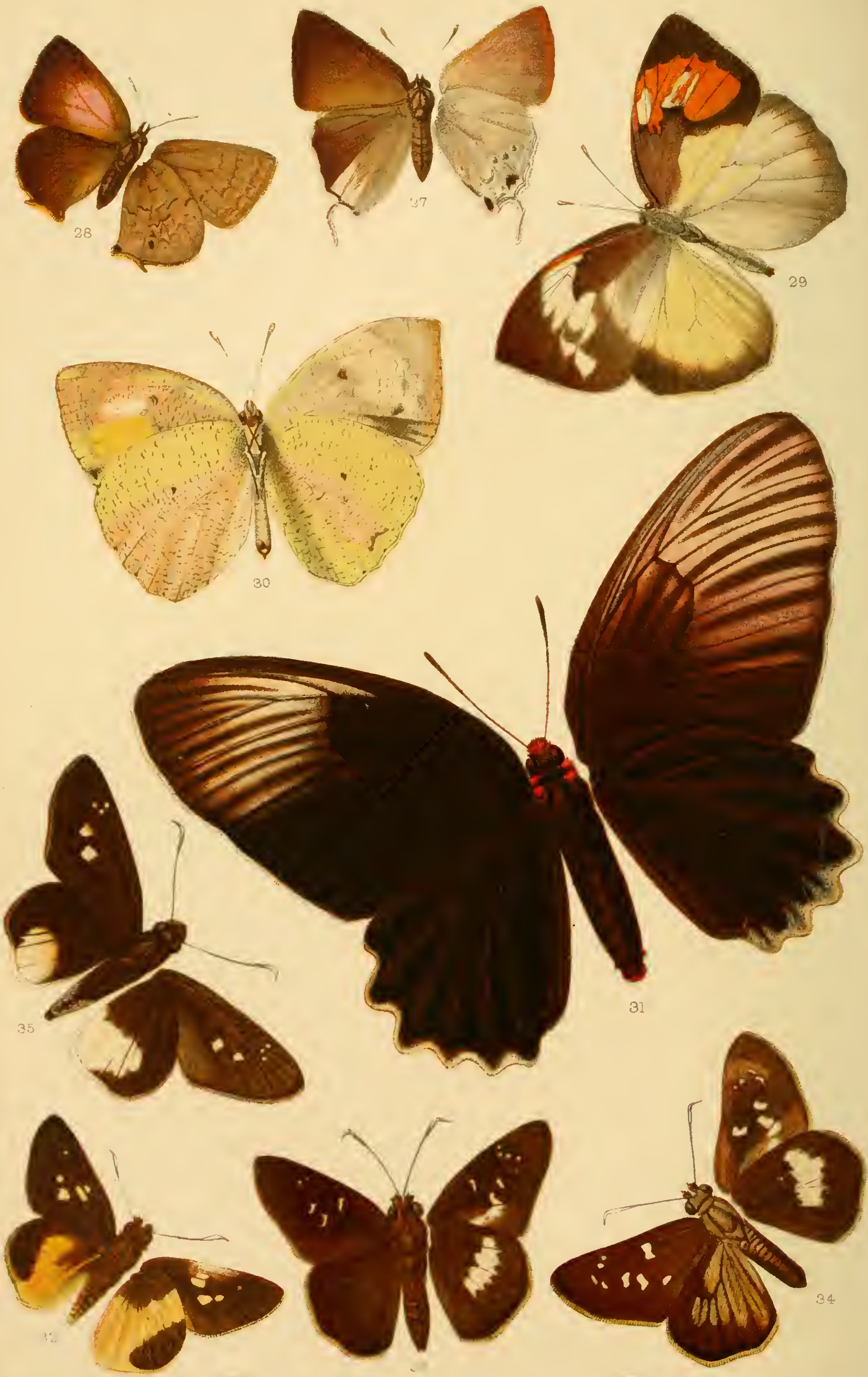
EASTERN BUTTERFLIES

L. de NICEVILLE Journ. Bomb. Nat. Hist. Soc. Vol XII. Plate AA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G. C. Chukraburtty del. West, Newman chromo.

EASTERN BUTTERFLIES

ON NEW AND LITTLE-KNOWN BUTTERFLIES FROM THE INDO-MALAYAN, AUSTRO-MALAYAN, AND AUSTRALIAN REGIONS.

BY LIONEL DE NICEVILLE, F.E.S., C.M.Z.S., &c.

[*With Plates X, Y, Z, & AA.*]

(*Read before the Bombay Natural History Society on* 14*th June*, 1898.)

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. EUPLŒA (*Crastia*) CORE, Cramer, pl. X, figs. 1, 2, ♂.

Papilio core, Cramer, Pap. Ex., vol. iii, pl. cclxvi, figs. E, F (1780).

The specimen figured is from Sikkim, and has been kindly lent to me by Mr. Paul Möwis. The left-hand side of the insect is much smaller than the right-hand side, so that at first sight it appears to be a bilateral gynandromorphous specimen; but on examination closely the forelegs are found to be both masculine, and there is the usual male brand on both forewings in the middle of the submedian interspace, the brand on the smaller left-hand wing being only 4 mm. in length, while that on the opposite wing is 9 mm. long, or more than twice the length of the other. The number of spots on both pairs of wings on the upperside is the same, but on the underside the larger forewing has three additional violet spots, one each in the first and second subcostal, and the third in the lower discoidal, interspaces. On the larger hindwing also there are five additional violet spots, a large apical one in the subcostal interspace, and seven instead of three, placed one in each interspace beyond the discoidal cell. The specimen is altogether a very remarkable one; it is not an ordinary aberration or "sport," nor is it gynandromorphous, so it is difficult to know how to classify it. Owing to the difference in the size of the white markings on the upperside of the forewing, the smaller left-hand wing may be said to be true *E. core*, while the larger right-hand wing, with its disproportionally larger markings, is a typical *E. vermiculata*, Butler, the latter name applying in the writer's opinion to the dry-season form of *E. core*, true *E. core* being the wet-season form (*vide* this Journal, vol xi, p. 214, n. 7 (1897).

2. EUPLŒA (*Trepsichrois*) LINNÆI, Moore, pl. X, figs. 3, 4, ♂.

Trepsichrois linnæi, Moore, Proc. Zool. Soc. Lond., 1895, p. 286, n. 1, pls. xxix' fig. 4, *female*; xxx, fig. 1, *male*.

The remerkable aberration or "sport" here figured was taken in Sikkim, and has been kindly lent to me by Mr. Paul Möwis, of Darjiling. From typical specimens of the species from the same region it differs in the shape of the forewing, which has the outer margin from the lowest discoidal nervule to the apex produced and truncated, and the neuration is highly abnormal, not being even the same on both wings; the left-hand wing has five instead of the normal two discoidal nervules, numbers one, three, four, and five counting from behind forwards arising from the disco-cellular nervules, and number two arising from number one close to its base; in addition to this, numbers three and five give off anteriorly near the middle a short spur or additional veinlet; the subcostal nervure instead of reaching the outer margin of the wing just below the apex of the wing stops short a little before reaching the outer margin; lastly the discoidal cell is abnormally broad outwardly, with several additional disco-cellular nervules closing it, from which spring two (instead of the normal one) spurs running a short distance into the cell: the right-hand wing also has five discoidal nervules, but they differ from those in the opposite wing, in that number five does not give off a spur, while number three instead of giving off a spur anteriorly does so posteriorly, which spur at its apex bifurcates and is continued a short distance right and left at right-angles to its basal portion; the subcostal nervure is the same as in the opposite wing, its terminal portion (often called the fifth subcostal nervule) not reaching the outer margin. The left-hand hindwing (when the specimen is turned once) is abnormal, as it has two instead of one discoidal nervules, and the discoidal cell is unusually broad; the right-hand wing also possesses this extra veinlet, but in addition it gives off anteriorly a third discoidal nervule. The markings also are abnormal, the forewings on the upperside having each six bluish-white spots beyond the discoidal cell instead of three, the three additional spots owing their existence to the presence of three additional internervular interspaces, there being three extra discoidal nervules; these spots all reappear on the underside of the wings, but are as usual much smaller than on the upperside. The hindwings on the upperside are normal; but on the underside the discoidal cell bears outwardly four bluish-white dashes; normally there is one or at most two such markings; the submarginal, marginal, and discal series of dots and streaks are also more numerous than usual, as there is an additional discoidal interspace on one side and two on the other.

The coloured drawing shows the upper- and undersides of the left-hand wings only; the uncoloured drawing shows the underside of all the wings.

Subfamily SATYRINÆ.

Genus MYCALESIS, Hübner, subgenus PHYSCON, nov.

MALE. FOREWING, *costa* regularly and evenly arched; *apex* well rounded; *outer margin* almost straight, slightly convex only; *anal angle* rounded; *inner margin* a little convex; *costal nervure* swollen at the base, ending on the costa far beyond the apex of the discoidal cell; *first subcostal nervule* arising about one-fourth before the end of the cell, terminating on the costa about opposite to the origin of the third subcostal; *second* subcostal originating far beyond the end of the cell, ending on the costa at about opposite to the origin of the fourth subcostal; *third* subcostal arising about midway between the second and the fourth, terminating on the costa well before the apex of the wing; *fourth* subcostal long, terminating on the costa before the apex of the wing; terminal portion of the *subcostal nervure* longer that the fourth subcostal nervule, ending on the outer margin below the apex of the wing; *upper disco-cellular nervule* short, straight, upright; *middle* disco-cellular concave, strongly inwardly oblique, twice as long as the upper disco-cellular; *lower* disco-cellular very long, at first strongly inwardly oblique, then boldly curving round towards the outer margin, the posterior portion strongly outwardly oblique; *median nervure* swollen at the base; *third median nervule* arising at the lower end of the cell, strongly curved; *second* median arising long before the lower end of the cell; *first* median arising a little beyond the middle of the median nervure; *submedian nervure* swollen at the base, straight; a large tuft of black hairs arises from the middle of the sutural area on the upper surface of the wing; these hairs are directed outwards and forwards, their tips lying on the submedian nervure. HINDWING, *costa* arched at base, then slightly convex to the apex of the wing; *apex* acute; *outer margin* angled at the termination of the third median nervule, very slightly scalloped; *anal angle* rounded; *abdominal margin* convex; *præcostal nervure* simple, concave, directed towards the apex of the wing; *first subcostal nervule* curved, arising well before the apex of the cell, terminating on the costa far before the apex of the wing; *second* subcostal terminating at the apex of the wing; *discoidal cell* long, reaching to about the middle of the wing; *discocellular nervules* sinuous, outwardly oblique, the *upper* about half the length of the lower; *third median* nervule very strongly curved throughout its basal half; third and *second* medians arising together just beyond the lower extremity of the cell; *submedian* and *internal nervures* straight; a tuft of long ochreous hairs arises at the base of the cell on the upperside of the wing, and is projected outwards and forwards. *Eyes* hairy. *Antennæ* a little less than half the length of the costa of the forewing, with a lengthened rather slender club. Type, *Mycalesis* (*Physcon*) *pandæa*, Hopffer.

Mr. Moore in Trans. Ent. Soc. Lond., 1880, p. 155, when breaking up the Asiatic species of *Mycalesis* into subgenera, was unacquainted with *M. pandæa*, Hopffer, or he would probably have made a new genus for its reception. As far as I am aware, only two of his genera—*Lohora* and *Loesa*—have the second subcostal nervule of the forewing emitted beyond the apex of the discoidal cell as in *M. pandæa*; but I am unacquainted with his genus *Nasapa*,* in the diagnosis of which no reference is made to the position of this veinlet. *Lohora* has no secondary sexual characters at all on the forewing, while *Loesa* has a glandular patch of androconia on the underside of that wing, which is entirely lacking in *Physcon*, while *Physcon* has a tuft of hairs on the sutural area of the forewing on the upperside, which is found in a different form in the subgenera *Virapa*, *Samundra*, *Gareris*, *Satoa*, *Sadarga*, *Dalapa*, *Suralaya* and *Orsotriæna*, but not in *Loesa*. It would appear therefore that *Physcon* has secondary sexual characters in the male on both wings as in Mr. Moore's Group I (l. c., p. 155), while as regards the neuration of the forewing it agrees with one genus in his Group II (l. c., p. 161), and with his Group III (l. c., p. 177).

3. MYCALESIS (*Physcon*) PANDÆA, Hopffer, pl. Y, fig. 9, ♂.

M. pandæa, Hopffer, Stet. Ent. Zeit., vol. xxxv, p. 39, n. 116 (1874); id., Moore, Trans. Ent. Soc. Lond., 1880, p. 177; *M. deianirina*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlii, p. 117 (1897).

HABITAT: Celebes (*Hopffer* and *Moore*); Toli Toli, North Celebes, Nov.—Dec., 1895, H. Fruhstorfer (*Fruhstorfer* and *coll. de Nicéville*).

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* Herr George Semper in Schmett. Philipp., p. 55 (1887) sinks the genus *Nasapa* under *Nebdara*. The latter has the second subcostal nervule of the forewing emitted before the end of the discoidal cell.

This species has a remarkable superficial resemblance to *M.* (*Lohora*) *ophthalmicus*, Westwood, *M.* (*Lohora*) *dexamenus*, Hewitson, *M.* (*Lohora*) *dinon*, Hewitson, *M.* (*Lohora*) *deianira*, Hewitson (= *M. dora*, Hewitson), all of which occur in the same island; but the secondary sexual characters of the male will distinguish that sex from all these. The female is unknown, and will probably be difficult to discriminate. Mr. Francis A. Heron of the British Museum has kindly examined the drawing here reproduced, and informs me that it does not quite agree with Hopffer's description of his unique male example, but that it certainly represents the *M. deianirina* of Fruhstorfer, described from Toli Toli in North Celebes. There can be but little doubt, I think, that Hopffer's and Fruhstorfer's species are one and the same. Herr Fruhstorfer has at my request compared the types of the two species in Berlin, and has kindly furnished me with the following note regarding them:—"*M. deianirina* is almost a synonym of *M. pandœa*, at best it is only a local race. The type of the latter species bears the unsatisfactory label 'Celebes, A. B. Meyer.' *M. deianirina* differs, as also does a second specimen in my collection, from *M. pandœa* in having waved instead of straight marginal and submarginal lines on the underside of the forewing, and those lines on the hindwing are black instead of brown; the apex of the hindwing bears a lilac band, which is not found in *M. pandœa*; my species has eight while Hopffer's species has six ocelli on the hindwing; my species has broader and darker brown median lines on both wings than *M. pandœa*." I do not understand M. Fruhstorfer's remark that *M. pandœa* has six ocelli and *M. deianirina* eight on the hindwing, as my specimen has only four.

Subfamily ELYMNIINÆ.

4. ELYMNIAS (*Melynias*) EXCLUSA, de Nicéville, pl. X, fig. 5, ♂.

E. (*Melynias*) *exclusa*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 681, n. 68 (1898).

HABITAT: Bali, 2,000 to 4,000 feet, March, 1896 (*Doherty*).

EXPANSE: ♂, 3·0 inches.

DESCRIPTION: "MALE. Differs from the same sex of *E. casiphone prætextata*, Fruhstorfer, from the low country of Bali and from Lombok, in having the UPPERSIDE of the *forewing* entirely deep uniform velvety black, without markings, in that species the ground-colour is fuscous becoming outwardly much paler, with a submarginal series of six bluish-white spots. *Hindwing* differs also in having the ground-colour much darker, with a submarginal series of four prominent transversely-elongated ochreous-white spots placed between the veins, these being obsolete in that species ; it is heavily clothed on the disc with long black hairs. UNDERSIDE, *both wings* much as in that species. Differs from *E. erinyes*, de Nicéville,* from the Battak Mountains of North-east Sumatra, in the forewing being shorter, less elongated, and on the upperside of the hindwing in not having a series of perpendicularly-elongated pale streaks between the veins. Differs from *E. kamara* Moore,† from Java (*Moore*), and Lombok (*Fruhstorfer*), only in having on the UPPERSIDE of the *hindwing* a single series of narrow ochreous-white spots, instead of a second and third series anterior to the first extending towards the base of the wing. FEMALE unknown."

"In de Nicéville and Elwes' collections are single males." (*de Nicéville*, l. c.).

5. ELYMNIAS (*Melynias*) NEOLAIS, n. sp., pl. X, fig. 6, ♀.

Elymnias lais, Kheil (*nec* Cramer), Rhop. Nias, p. 20, n. 39 (1884).

HABITAT : Nias Island, near Sumatra.

EXPANSE : ♂, 2·9 ; ♀, 3·3 inches.

DESCRIPTION : MALE. Almost exactly the same as true *E. lais*, Cramer, from Java, but on the upperside of both wings the pale greenish-ochreous streaks between the veins are somewhat narrower and darker. On the underside of both wings it differs from *E. laisidis*, de Nicéville,‡ from North-east Sumatra, in having all the dark markings much larger and of a deeper colour, therein agreeing with *E. lais*. FEMALE. UPPERSIDE, *forewing* has a large triplicate subapical white patch divided only by the veins and strongly glossed with violet, this gloss barely extends beyond the white patch. In *E. laisidis* the violet gloss is of much greater extent, and reaches to the submedian interspace, and is also much wider, reaching the discoidal cell. *E. lais* has no violet gloss whatever. In outline it is nearest to *E. lais*, but the wing is rather longer, though it is not as long as it is in *E. laisides*. The *hindwing* has the pale streaks between the veins less wide than in *E. laisidis*, still less wide than in *E. lais*.

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[*] Journ. Bomb. Nat. Hist. Soc., vol. x, p. 19, n. 5, pl. R, figs. 9, *male* ; 10, *female* (1895).

[†] Journ. Bomb. Nat. Hist. Soc., vol. x, n. 20, pl. R, fig. 11, *male* (1895).

[‡] Journ. A. S. B., vol. lxiv, pt. 2, p. 390, n. 96 (1896).

Described from five males and one female, all received from Mr. H. Fruhstorfer. I have figured for comparison the females of *E. laisidis* and *E. lais* on pl. Y, figs. 7 and 8 respectively.

Subfamily AMATHUSIINÆ.

6. DISCOPHORA DEO, n. sp., pl. Y, fig. 10, ♂.

HABITAT : North Shan States, Upper Burma.

EXPANSE : ♂, 3·5; ♀, 4·0 and 4·2 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* deep indigo-blue. *Forewing* with a broad curved discal orange band, of nearly equal width throughout, its edges rather irregular, commencing on the costa broadly, and ending on the first median nervule, not reaching the outer margin, broken posteriorly by a spot of the ground-colour which reaches from the first median nervule to the middle of that interspace; the orange band is continued beyond the first median nervule to the middle of the submedian interspace by an obscure orange spot ; the costa is narrowly orange for some distance on either side of the discal band ; the outer margin is also very narrowly orange. *Hindwing* with the usual velvety rounded deep black sexual patch in the middle of the wing ; a series of outer-discal most obscure pale spots between the veins ; the outer margin narrowly orange. UNDERSIDE, *both wings* deep ochreous, spotted, streaked and mottled with black as in the Indian form of *D. celinde*, Stoll (*D. continentalis*, Staudinger). *Hindwing* with two small and obscure ocelli. FEMALE. Indistinguishable on both surfaces from the same sex of *D. continentalis* from North-east India.

This species is based on the male sex alone, and is the only species of the genus hitherto described with a broad discal orange band on the upperside of the forewing in that sex. In the *D. celinde* group the females possess a similar though broader band. The female of *D. deo* is quite indistinguishable from the same sex of *D. continentalis*. It is possible that *D. deo* is the dry-season form of the Upper Burmese race of the last-named species ; but in the region where *D. deo* was obtained no collections have been made in the rainy season.

Described from one male taken in January and two females in March at Hsipaw, North Shan States, by Major F. B. Longe, R. E., to whom I am indebted for the gift of the specimens. In the collection of the late Captain E. Y. Watson are other examples from the same region.

Subfamily NYMPHALINÆ.

7. CETHOSIA NARMADOIDES, de Nicéville, pl. Y, fig. 11, ♂.

C. narmadoides, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 683, n. 85 (1898).

HABITAT: Bali (*Doherty*).

EXPANSE: ♂, 2·9 and 3·2 inches.

DESCRIPTION: "MALE. UPPERSIDE, *both wings* differ from the same sex of *C. narmada*, Fruhstorfer, from Lombok, in having the outer-marginal black areas much narrower, thus leaving the discal and basal red areas much larger, these occupying the whole of the discoidal cell in the forewing instead of the posterior half only; and in the hindwing leaving quite free the outer-discal series of round black spots, instead of extending right up to and more or less including them. *Forewing* has the subapical oblique series of markings reddish-ochreous instead of whitish; they are conjoined, much larger and more numerous than in *C. narmada*, in the latter the anterior of the three subapical spots is widely separated from the two posterior ones. UNDERSIDE, *both wings* have the ground-colour much paler, in *C. narmada* it is heavily suffused with black, and the discal pale ochreous band is much broader in the present species. FEMALE unknown."

"The figure of *C. narmada* * does not agree with the specimens of that species in my collection received from and named by Mr. H. Fruhstorfer. Instead of having on the upperside of the forewing three subapical spots only, there is a nearly complete series as in *C. narmadoides*; and on the hindwing the outer-discal series of black spots is free of the marginal black band, thereby agreeing with *C. narmadoides*, instead of being absorbed in the band. It is described from two male specimens taken by Mr. W. Doherty in the low country of Bali in April, 1896. There are other specimens in Mr. H. J. Elwes' collection." (*de Nicéville*, l. c).

8. *Note on* Neptis praslini, *Boisduval, and some species allied to it.*

In the Journal of the Asiatic Society of Bengal, vol. lxvi, pt. 2, pp. 533—541 (1897), I published a short paper entitled "Description of *Neptis praslini*, Boisduval, and some species allied to it." Dr. A. G. Butler, of the British Museum (Natural History), has kindly examined proofs of three of the woodcuts therein published, and has given me notes on them, which prove that my identifications of some of the species were incorrect. No. 1, which I followed Dr. O. Staudinger in considering to be the true "*Limenitis*" *praslini* of Boisduval, described by the latter from New Ireland, and redescribed and figured by me from Northern Australia, is not that species, and requires a new name; and I propose *N. staudingereana* for it, as it was figured by the learned doctor from Northern Australia. No. 2, *Neptis lactaria*, Butler, is correct, Dr. Butler noting that there are exactly similar specimens in the British Museum from N.-E. New Guinea. No. 3, *Neptis nausicaa*, de Nicéville, is the *Neptis papua* of Oberthür, and there are specimens in the British Museum from Dorey, New Guinea, says Dr. Butler, so my name falls as a synonym to Oberthür's. The latter author himself stated that he considered his *N. papua* had better sink to *N. praslini*, in which I followed him, but it seems to be quite distinct. No. 4, *Neptis nemeus*, de Nicéville, is typical *N. praslini*, Boisduval, so my name falls as a synonym, Dr. Butler noting that it is in the British Museum from New Ireland, my specimen being from New Britain.

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* *Cetosia* [sic !] *narmada*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xli, p. 380, pl. ix, fig. 2, *male* (1897).

9. RHINOPALPA CALLONICE, Fruhstorfer, pl. Y, fig. 12, ♂.

R. polynice, Kheil (*nec* Cramer), Rhop. Nias, p. 22, n. 41 (1884); *R. fulva*, idem (*nec* Felder), n. 42; *R. polynice callonice*, Fruhstorfer, Berl. Ent. Zeitsch., vol. xlii, p. 330 (1898).

HABITAT: Nias Island, near Sumatra.

EXPANSE: ♂, 2·7 inches.

DESCRIPTION: MALE. Nearest to *R. elpinice*, Felder,* from Java, from which it differs on the UPPERSIDE of the *forewing* in the outer black border being narrow, only 6 mm. wide, where it crosses the submedian nervure, instead of 10 mm.; the black border is consequently outwardly oblique instead of almost upright. *Hindwing* also with the outer black border very much narrower, nearly half as wide, and of a much less intense black colour, thereby allowing the black ocelli of the underside to appear on the border as oval blind intensely black spots. UNDERSIDE, *both wings* have the ground-colour much paler, thereby allowing all the markings to appear more prominently; the rufous markings greatly obliterated, entirely so on the outer margins and tail; the violet markings also are obsolete.

Herr Napoleon Kheil records both *R. polynice*, Cramer, and *R. fulva*, Felder, from Nias; but these two names represent one species, which is found in Assam, Burma, the Malay Peninsula, and Sumatra. "*Vanessa*' *eudoxia*, Guérin, from the Malay Coast, is without doubt the female of *R. polynice.* A third synonym is the *R. polynice birmana* [*sic* !] of Fruhstorfer, l. c., p. 331, from Lower Burma (*Fruhstorfer*). *R. elpinice*, Felder, occurs in Java and Bali, *R. megalonice*, Felder, in Celebes, and *R. stratonice*, Felder, in most of the islands of the Philippine Archipelago.

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* *Eurhinia elpinice*, Felder, Reise Novara, Lep., vol. iii, p. 405, n. 606 (1867).

Described from a single male received from Herr H. Fruhstorfer. The above description was written long before Herr Fruhstorfer's description of the species appeared, but may be allowed to stand. In a copy of his paper lately received from him he changes the name of the species in manuscript to "*callinice*."

10. CHARAXES KEIANUS, Rothschild, pl. Z, figs. 13, ♂; 14, ♀.

C. pyrrhus keianus, Rothschild, Nov. Zool., vol. iv, p. 508, n. 2 (1897); id., de Nicéville and Kühn, Journ. A. S. B., vol. lxvii, pt. 2, p. 262, n. 42 (1898).

HABITAT: Ké Isles.

EXPANSE: ♂, 3·8; ♀, 4·3 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* differs from the same sex of *C. jupiter*, Butler,* from Port Moresby in New Guinea, Dory in New Guinea (the type), and Duke of York Island, in the discal pale yellow band being broader throughout; the quadrate spot in the second median interspace nearly twice as large, and placed much nearer the base of the interspace; with a considerable-sized spot anterior to the latter in the lower discoidal interspace, touching or almost touching the lower disco-cellular nervule, this spot in *C. jupiter* being reduced to a mere dot. *Hindwing* has (contrary to that of the forewing) the discal pale yellow band very considerably narrower, almost half as wide. UNDERSIDE, *both wings* with the same differences as above. FEMALE. Differs only from the male in being larger; *both wings* on the UPPERSIDE with the submarginal series of spots more prominent.

From the male of *C. attila*, Grose Smith,† from Guadalcanar, the same sex of *C. keianus* differs on the UPPERSIDE of the *forewing* in the discal band being of quite a different shape, and in the *hindwing* in the discal band being far narrower, produced posteriorly to a point; in *C. attila* it is of the same width throughout. Dr. A. G. Butler (Journ.

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* *C. jupiter*, Butler, Lep. Ex., p. 14, n. 4, pl. v, figs. 4, 7, *male* (1869).

† *C. attila*, Grose Smith and Kirby, Rhop. Ex., pl. *Charaxes* v, figs. 1, 2, *male* (1891).

Linn. Soc. Lond., Zoology, vol. xxv, p. 387 (1896), reduces *C. attila* to the rank of a "var." of *C. jupiter*, but it is really more distinct from that species than is *C. keianus*. As these insular local races appear to be constant where each occurs, they are in my opinion worthy of full specific rank.

Described from three males and two females received from Herr Heinrich Kühn, after whom I had intended to name it had not Mr. Rothschild published his description first from specimens from Kei Toeal and Great Kei.

Family LYCÆNIDÆ.

11. GERYDUS LONGEANA, n. sp., pl. Z, figs. 15, ♂; 16, ♀.

HABITAT: Upper Burma.

EXPANSE: ♂, 1·4 to 1·8; ♀, 1·2 to 1·6 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* dull brown at the base, the outer half dull fuscous; a curved discal whitish band divided into five parts by the dark veins, the anterior portions divided by the third median and lower discoidal nervules elongated, the two posterior portions placed behind the outer posterior end of the portion anterior to them small and nearly quadrate; base of the third median nervule swollen and bare of scales. *Hindwing* rounded, varying in colour, sometimes entirely pale brown, with the costa broadly dull fuscous, sometimes the posterior two-thirds stone-colour. UNDERSIDE, *both wings* ochreous-brown, with the annular markings as in specimens of *G. boisduvali*, Moore, from Sikkim. *Forewing* with a broad curved discal white band, of equal width throughout, extending from the upper discoidal nervule to the inner margin, its inner and outer edges irregular. *Hindwing* with a transverse discal dark brown fascia; the submarginal series of black dots not very conspicuous. FEMALE. UPPERSIDE, *both wings* creamy-white. *Forewing* with the apex broadly, the outer margin decreasingly, dull fuscous, sometimes with a small black patch in the middle of the wing placed on the bases of the first and second median nervules. *Hindwing* slightly angled at the termination of the third median nervule, with the costa broadly pale fuscous; this fuscous area is larger in those specimens with the discal black patch in the forewing than in those without it. UNDERSIDE, *both wings* very similar to those of the male, but the ground-colour is more ochreous and much paler.

Apparently nearest to *G. boisduvali*, differing therefrom in the male in the upperside of both wings being of two shades, dull brown and black instead of ferruginous throughout, and in the discal markings of the forewing being much larger, whitish, and altogether more conspicuous. The female differs from the same sex of *G. boisduvali* in having both wings on the upperside mostly creamy-white instead of ferruginous. The only described species from the Malay Peninsula and India I have not seen are *G. heracleion*, Doherty, from Perak, which has in the male on the upperside of the forewing a " slaty [bluish] gloss " as in *G. symethus*, Cramer ; the markings also differ in detail ; and *G. irroratus*, Druce, [*recte G. boisduvali*, Moore, as *G. irroratus* is a synonym of *G. boisduvali*], var. *assamensis*, Doherty, from the Dhansiri Valley, Naga Hills, but that species has only a very small longitudinal pale area around the base of the third median nervule on the upperside of the forewing.

Taken commonly at Hsipaw, in the Northern Shan States, Upper Burma, from December to February, by Major F. B. Longe, R.E., after whom I have much pleasure in naming it.

I may note here that my remark in " The Butterflies of India, Burmah and Ceylon," vol. iii, p. 22 (1890), that in the genus *Gerydus* " The males have no secondary sexual characters " is partially incorrect. In my collection the following species in the male have the base of the third median nervule of the forewing swollen and bare of scales :—*Gerydus symethus*, Cramer (=*G. pandu*, Horsfield), *G. leos*, Guérin (=*G. boisduvalii*, Butler, nec *G. boisduvali*, Moore, and *G. teos*, Doherty), *G. maximus*, Holland, *G. zinckenii*, Felder, *G. gopara*, de Nicéville (probably equals *G. biggsii*, Distant), *G. gigantes*, de Nicéville, *G. ancon*, Doherty, *G. boisduvali*, Moore (=*G. irroratus*, Druce), *G. chinensis*, Felder, *G. philippus*, Staudinger, *G. ceramensis*, Ribbe (=*G. acragas*, Doherty), *G. melanion*, Felder, and *G. longeana*, de Nicéville. The following species, which I have not seen, are said by their describers to have the same male secondary sexual character :—*Gerydus irroratus*, var. *assamensis*, Doherty, *G. gigas*, H. H. Druce, *G. vincula*, H. H. Druce, *G. improbus*, H. H. Druce, and *G. heracleion*, Doherty. The following species in my collection have the base of the third median nervule of the forewing simple (not swollen) and covered with scales :—*Gerydus croton*, Doherty, *G. gæsa*, de Nicéville, and *G. innocens*, H. H. Druce. The absence or presence of male secondary sexual characters in the following species is unknown to the writer—(*a*) owing to females only having been described: *Gerydus petronius*, Distant, *G. gallus*, de Nicéville, *G. gœtulus*, de Nicéville—(*b*) owing to no mention by the describers of any male sexual characters: *Gerydus biggsii*, Distant, *G. drucei*, Semper, *G. learchus*, Felder, *G. stygianus*, Butler, and (?) *G. plautus*, Fabricius.

12. LOGANIA WATSONIANA, n. sp., pl. Z, figs. 17, ♂; 18, ♀.

HABITAT: Upper Burma.

EXPANSE: ♂, 1·1 to 1·4; ♀, 1·1 to 1·3 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* with the basal two-thirds greyish-blue, the apex and outer margin broadly black; an oval outwardly-oblique discal white patch just beyond the discoidal cell, crossed by the third median nervule, which, as in some species of *Gerydus*, is swollen at the base (though not quite to the same extent) and bare of scales. *Hindwing* with the costa as far as the subcostal nervure and second subcostal nervule black, the rest of the wing greyish-blue. UNDERSIDE, *forewing* dull fuscous, the apex mottled with ferruginous, the outer margin broadly black; a broad discal curved white fascia, of about equal width throughout, commencing about the subcostal nervure and ending on the inner margin. *Hindwing* fuscous, profusely irrorated with ferruginous. FEMALE. UPPERSIDE, *forewing* differs from the male in having the discal white patch less prominent, and merged into the greyish-blue basal area. Otherwise much as in the male.

This species in the only *Logania* known to me which has a broad discal curved white fascia on the underside of the forewing in both sexes. *L. sriwa*, Distant, and *L. malayica*, Distant, are the only two species in my collection which have the base of the third median nervule in the male not swollen.

Described from six pairs in Major F. B. Longe's and my own collection, taken at Hsipaw in the Northern Shan States, roughly between Lat. 22° and 23° and Long. 97°. I have named this species after the late Captain E. Y. Watson, from whom I first received it, who had made a speciality of the butterflies of Burma.

13. CYANIRIS CARA, n. sp., pl. Z, figs, 19, ♂; 20, ♀.

HABITAT: South Celebes.

EXPANSE: ♂, 1·0 to 1·1; ♀, 1·0 to 1·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* dark plumbeous-purple, exactly the same shade as in typical species of the genus *Nacaduba*. *Fore-*

wing with an anteciliary black thread. *Hindwing* with two submarginal subanal black dots between the veins, and a marginal black thread. *Cilia* of the forewing anteriorly black, posteriorly and of the hindwing white, at the terminations of the veins black. UNDERSIDE, *both wings* pale French-grey, with all the markings of a slightly darker grey than the ground-colour, and outwardly defined with a narrow white line. *Forewing* with a large quadrate spot at the end of the discoidal cell; a discal series of five rounded conjoined spots, the anteriormost spot nearer the base of the wing than the others; a submarginal lunular band, and a marginal series of linear spots between the veins. *Hindwing* with the base metallic-greenish; the usual spots across the base, a large one at the end of the cell, a highly irregular discal series, the marginal markings as in the forewing, except that the submarginal lunular band is more deeply indented and is a little further removed from the margin. *Cilia* of both wings French-grey, in the hindwing bearing a black dot at the end of each vein. FEMALE. UPPERSIDE, *both wings* shining bluish-purple, but of a much lighter shade than in the male. *Forewing* with the costa, apex and outer margin broadly black; a prominent wedge-shaped black spot at the end of the discoidal cell, beyond which the ground-colour is just touched with white. *Hindwing* with a narrow black disco-cellular streak; six marginal oval black spots between the veins, outwardly defined with pale blue; a prominent anteciliary black thread. UNDERSIDE, *both wings* marked as in the male.

Apparently nearest to *C. musina*, Snellen,* from Perak, Sumatra, Java and Lombok, from the male of which (the female I have not seen) it differs on the upperside of both wings in being of a still deeper plumbeous colour, and on the underside in having none of the spots black, and the discal series on the forewing forming a continuous chain instead of the spots being placed in echelon. The markings on the underside of *C. cara* are highly peculiar, and are unlike those of any species of *Cyaniris* known to me, in that they are all uniform in colour, pale French-grey, none being black. They are wonderfully like those in *Nacaduba nelides*, mihi, from N.-E. Sumatra and W. Java, *vide* l. c., p, 280, n. 16, pl. O, fig. 24, *male*. It is also near to *C. lugra*, H. H. Druce,† from

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* *Vide* de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 275, n. 12, pl O, fig. 19, *male* (1895).

† Proc. Zool. Soc. Lond., 1895, p. 573, pl. xxxii, fig. 5, *male*.

Kina Balu, Borneo; but the coloration of the upperside is different, that species being "dull greyish silvery blue," and the hindwing on the underside in that species has some *blackish* spots. Mr. Henley Grose Smith has described a *Cyaniris lyce* * from South Celebes, but the description is very short, and no characteristic points are brought forward, so without a figure the description is useless for recognition.

Described from two pairs captured by Herr H. Fruhstorfer at Bua-Kraeng, in South Celebes, at an elevation of 5,000 feet, in February, 1896, and kindly given to me by that gentleman.

14. LAMPIDES LUNATA, n. sp., pl. Z, figs. 21, ♂; 22, ♀.

HABITAT: Toli Toli, North Celebes.

EXPANSE: ♂, ♀, 1·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* pale milky bluish-white, with a slight gloss only; *cilia* black tipped with white. *Forewing* with a rather broad submarginal, and an equally broad marginal, fuscous band, which are separated from one another by a narrow band of the ground-colour. *Hindwing* with a submarginal series of prominent fuscous lunules placed between the veins, beyond which is a series of oval fuscous spots increasing in size from the apex of the wing to the anal angle, each spot surrounded by a fine line of the ground-colour; a fine antemarginal black thread; *tail* black, tipped with white. UNDERSIDE, *both wings* pale brown; with a fine antemarginal black thread. *Forewing* with two pairs of white dots on the costa; the first and second fine white lines on the disc counting from the base forming a Y, the third line continuous from near the costa to the submedian nervure, the fourth line also continuous from near the costa to the second median nervule; two submarginal waved white lines, enclosing a series of prominent black spots, with a marginal series of oval black spots between the outer of the two submarginal white lines and a fine marginal white thread. *Hindwing* with the usual basal and discal fine white lines; a highly irregular submarginal white line; beyond which is a series of large black spots, the second from the costa the largest of all; a marginal series of oval black spots, surrounded by a fine white line, the black spot in the first median interspace the largest of all, at its two lower corners bearing metallic silvery-blue scales, and crowned with a fine orange line; with another fine orange line at the anal angle, outwardly marked with a few blue scales. FEMALE, UPPERSIDE, *both wings* fuliginous. *Forewing* with a large discal bluish-white patch. *Hindwing* with the base slightly bluish-white; the marginal markings much as in the male, except that the inner series of black lunules are inwardly defined by a fine white line. UNDERSIDE, *both wings* as in the male.

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* Nov. Zoo., vol. ii, p. 506 (1895)

Apparently nearest to "*Plebeius*" *snelleni*, Röber, Iris, vol. i, p. 54, pl. iv, fig. 9, *male* (1888), from Bonthain in South Celebes and Tomboegoe in East Celebes, from which the male differs in having a submarginal fuscous band on the upperside of the forewing; and both sexes differ in the disposition of the white bands on the underside of the forewing; in *Lampides snelleni* the inner pair of lines are parallel to one another, and both are continued to the submedian nervure not forming a Y, while the outer pair of lines form a Y, instead of the third line reaching the submedian nervure, and the fourth line the second median nervule. The markings of the underside of *L. lunata* agree better with those of *L. snelleni*, var. *batjenensis*, Röber, l. c., pl. iv, fig. 10, *female*, from Batjan; but the female of the present species has the white areas on the upperside of both wings very much smaller.

Described from three males and two females kindly sent to me by Herr H. Fruhstorfer.

15. LYCÆNESTHES TURNERI, Miskin, pl. Z, figs. 23, ♂; 24, ♀.

L. turneri, Miskin, Proc. Linn. Soc. New South Wales, second series, vol. v, p. 39 (1891); id., de Nicéville, Journ. A. S. B., vol. lxvii, pt. 2, p. 267, n. 59 (1898).

HABITAT: Ké Isles; Northern Australia.

EXPANSE: ♂, 1·5; ♀, 1·4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining plumbeous-purple, with a fine anteciliary black thread. *Hindwing* with the costa and abdominal margin broadly pale fuscous. UNDERSIDE, *both wings* pale French-grey or stone-colour, with bands and spots barely if at all darker than the ground-colour, but defined by outer fine white lines. *Forewing* with the disco-cellular nervules defined by a white line, with a similar line on either side of it; a rather broad regularly curved discal unbroken band from the costa to the submedian nervure, widest on the costa, gradually tapering posteriorly ; two submarginal lunular lines. *Hindwing* crossed by three highly irregular bands ; two submarginal lines more deeply lunular than in the forewing ; the usual round black spot in the first median interspace crowned narrowly with dark orange ; a fine black anteciliary thread, defined with an equally fine white line on either side. FEMALE. UPPERSIDE, *both wings* pale dull fuscous. *Forewing* with the discoidal cell and the basal half of the wing posterior to the cell dull blue ; an oval discal white patch, inwardly bounded by the disco-cellular nervules, anteriorly by the lower discoidal nervule, posteriorly almost reaching the submedian nervure. *Hindwing* with streaks of dull blue between the veins not nearly reaching the margin, the outer end of each blue streak excavated and whitish ; the margin bears a highly lunular pale blue line, enclosing outwardly a series of spots of the ground-colour, except the one in the first median interspace, which is deep black ; a fine anteciliary black thread, defined on both sides by an equally fine white thread ; the *cilia* developed into three short tooth-like tails from the terminations of the median nervules. UNDERSIDE, *forewing* with the white patch smaller than above, the discal band more prominent than in the male. Otherwise as in the male.

The male of this species is very similar to that sex of *L. emolus*, Godart, from the Ké Isles, differing, however, in its larger size, distinctly narrower (less broad) hindwing, with no submarginal black spots on the upperside ; in *L. emolus* from Ké there are three or four. On the underside of the forewing the discal band is continuous, evenly curved and evenly tapering, in *L. emolus* it is very irregular, of the same width throughout, its two lowest portions placed in echelon. The female is, as far as I am aware, unique in the genus, being the only one with a large white patch in the middle of the forewing.

Described and figured from a male and two females received from Herr Heinrich Kühn from the Ké Isles. I have also received a pair of specimens from Mr. Rowland E. Turner from Mackay in Northern Australia, with which the examples described above entirely agree. *L. turneri* was originally described from Cape York, Cardwell and Mackay, all in tropical North Australia. Mr. W. H. Miskin described the female only, but called it the male. The description of the male of *L. tasmanicus*, Miskin (l.c., p. 40) agrees fairly well with the male of *L. turneri*, except that on the underside of both wings the transverse bands are not "dark reddish-brown," nor are the bases of the wings "dark brown." In 1891 Mr. Miskin says he received it from Cairns in Northern Australia, and doubted the recorded habitat of his type specimen, which is said to have come from Tasmania.

16. CAMENA CAMERIA, n. sp., pl. Z, fig. 26, ♂.

HABITAT: South Celebes.

EXPANSE: ♂, 1·6 inches.

DESCRIPTION: MALE. Very near to *C. carmentalis*, de Nicéville, from the Khasi Hills, the Shan States in Upper Burma, and Nias,* but considerably larger. UPPERSIDE, *forewing* has the blue coloration less extensive, not reaching so near to the outer margin, of a lighter shade of blue, and highly iridescent, in some lights being almost invisible, which it never is in *C. carmentalis*. *Hindwing* with the black sexual basal patch as in that species, the blue patch beyond it of the same shade as in the forewing, but not so iridescent and more restricted to the base of the wing. UNDERSIDE, *both wings* of a paler, more silvery, shade than in *C. carmentalis*, an indistinct submarginal fascia, the disco-cellular nervules defined by a fine dark line; the discal line much more prominent and further from the outer margin, on the *hindwing* outwardly defined by a white fascia. The sexual tuft of hairs on the underside of the forewing the same as in *C. carmentalis*.

Described from a single specimen kindly given to me by Herr H. Fruhstorfer, taken by him in February, 1896, at Bua-Kraeng in South Celebes at 5,000 feet elevation.

17. DEUDORIX GÆTULIA, de Nicéville, pl. AA, fig. 27, ♀.

D. gætulia, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 338, n. 15, pl. II, fig. 12, *male* (1892).

HABITAT: Khasi Hills; Burma.

EXPANSE: ♀, 1·8 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* glossy pale hair-brown, becoming darker towards the margins. *Forewing* unmarked. *Hindwing* with a large anal white patch divided by the dark veins from the third median nervule to the submedian nervure, the portion in the second median interspace small, the one in the first median interspace the largest, the one in the submedian interspace also large; a prominent anteciliary black line, which becomes lost in the ground-colour of the wing after it has passed the anal white patch ; anal lobe black in the middle, outwardly defined with white. *Tail* twice as long as in the male, white, with a narrow black centre. *Cilia* of the hindwing white, very long on the abdominal margin, becoming hair-brown towards the apex of the wing ; of the forewing hair-brown. UNDERSIDE, *both wings* dull silvery-grey. *Forewing* with the costa narrowly, the apex somewhat broadly, the outer margin decreasingly, pale cupreous. *Hindwing* with an outer-discal series of black spots outwardly defined with white, the three anterior ones small, round, slightly increasing in size, the one in the submedian interspace crescentic, with a minute dot placed against it in the internal interspace, with another dot anterior to it on the abdominal margin ; an oval black spot near the margin in the first median interspace ; the submedian interspace near the margin sprinkled with black scales ; the anal lobe black ; a prominent anteciliary black thread from the anal lobe to the discoidal nervule, also extending along the abdominal margin for a short distance anterior to the anal lobe.

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* Journ. Bombay Nat. Hist. Soc., vol. vii, p. 335, n. 12, pl. II, fig. 10, *male* (1892).

The specimen described is in the collection of Major F. B. Longe, R.E., who captured it on the 8th January, 1887, at Ngokgale, near Hsipaw, North Shan States, Upper Burma. Males appear to be fairly common in the Khasi Hills of Assam, and vary in size from 1·5 to 1·9 inches in expanse ; they are also very variable in the extent of the markings on the underside, many of those described by me in the type being frequently obliterated. I may note here that the *Deudorix calderon*, Kheil, Rhop. Nias, p. 33, m. 116, pl. iv, fig. 25, *male* (1884), appears to be closely allied to *D. gætulia* and to "*Rapala*" *hypargyria*, Elwes, Proc. Zool. Soc. Lond., 1892, p. 643, pl. xliii, fig. 7, *male*, from the Karen Hills in Burma ; but I have seen no specimens of *D. calderon* from Nias, though the same species appears to occur in Java, a male from thence in Mr. Fruhstorfer's collection having been sent to me for identification. The three species above named are all very closely allied.

18. ZINASPA ZANA, n. sp., pl. AA, fig. 28, ♀.

HABITAT : Western China.

EXPANSE : ♀, 1·3 and 1·5 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* pale brown, with a slight vinous gloss ; *cilia* cinereous. *Forewing* with a small basal purple area reaching from the subcostal to the submedian nervure, occupying the whole of the discoidal cell. *Hindwing* unmarked; *tail* very short, reduced to a mere tooth. UNDERSIDE, *both wings* dark grey, with slightly darker markings outwardly defined with white. *Forewing* with a very irregular discal fascia, and an indistinct marginal fascia. *Hindwing* with a highly irregular discal fascia, and some very indistinct marginal markings; a small round black spot in the first median interspace well removed from the margin, faintly surrounded with ferruginous; anal lobe bearing a small black spot.

Mr. J. H. Leech in Butt. China, vol. ii, p. 346 (1893), records this species as *Z. distorta*, de Nicéville, from Ni-tou and Huang-mu-chang in Western China, with these remarks:—" My collectors found this species rather common. They differ from the Sikkim type in Möller's collection in being smaller, and in having the purple colour of the upperside darker in tone, while the underside is grey intead of ferruginous." My specimens differ from the same sex of *Z. distorta* from Sikkim, the North Shan States and Sumatra in having the purple colour of the upperside of the forewing less than half as extensive, and entirely wanting on the hindwing; the tail a quarter as long; and the ground-colour of the underside of both wings dark grey instead of dull ferruginous or cinnamon-coloured, with no vinous gloss; and on the hindwing there is no basal line.

Described from two specimens from Western China kindly sent to me by M. C. Oberthür. I have not seen the male.

19. HYPOTHECLA HONOS, n. sp., pl. Z, fig. 25, ♀.

HABITAT: North Celebes.

EXPANSE: ♂, 1·65; ♀, 1·65 to 1·80 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* dull black, obscurely glossed with purple. *Forewing* with the purple coloration confined to the discal area. *Hindwing* with the veins black; a marginal series of black spots between the veins inwardly defined by a whitish-violet line, each spot produced inwardly to a point; a fine anteciliary white and then an equally fine black line. *Cilia* long and white, bearing in the middle a very fine black line. (Looked at under a magnifying glass the margin appears to bear five lines—three white and two black.) *Tail* from the termination of the first median nervule about 6 mm. in length, fine, black, ciliated and tipped with white. UNDERSIDE, *both wings* pale brown, the markings mostly darker brown, outwardly defined with whitish. *Forewing* with a quadrate marking at the end of the discoidal cell; a catenulated discal band consisting of eight portions, broken in the middle, the posterior moiety shifted inwardly towards the base of the wing; a submarginal lunulated band; a marginal series of oval spots between the veins; a very fine anteciliary black thread. *Hindwing* with three prominent rounded deep black spots arranged across the base, a large one just behind the middle of the costal nervure, a smaller one in the middle of the cell, a still smaller one in the middle of the abdominal margin; an elongated marking at the end of the cell; a much broken discal band, the anterior portion consisting of two spots, the middle portion also of two spots, but shifted outwardly, the lower portion of four spots, which are recurved to the abdominal margin; a submarginal lunulated band; a marginal series of oval spots between the veins, the one in the first median interspace larger than the others and crowned with orange, outwardly bearing a clump of metallic turquoise-blue scales; a fine anteciliary black thread. *Cilia* of both wings white bisected by a black line. FEMALE. UPPERSIDE, *both wings* dull black with no purple gloss. *Forewing* with an elongated discal whitish area in the second median interspace, which in some lights appears of a rich blue iridescent colour. *Hindwing* as in the male. UNDERSIDE, *both wings* with the ground-colour whitish, paler than in the male, the markings very similar.

The only other species known in this genus (which is an excellent one, with only two subcostal nervules to the forewing in both sexes, no secondary male sexual characters, and allied to *Thecla*, as Herr Georg Semper points out), is *Hypothecla astyla*, Felder, from the Philippine Islands, from which *H. honos* differs in the much duller coloration of both wings of both sexes on the upperside, that species having the purple coloration much more developed, and specially in the markings of the underside, in *H. astyla* the discal band in both wings is continuous and unbroken, in *H. honos* it is once fractured in the forewing and twice in the hindwing; also the submarginal band in *H. astyla* is straight with even edges, in *H. honos* it is highly lunulated.

Described from one male and five females kindly sent to me by the capturer, Herr H. Fruhstorfer, from Toli Toli, North Celebes, November-December, 1895. All are in poor condition as regards the upperside, but the markings of the underside are in every specimen perfectly clear and distinct. It appears to be a very delicate insect, and easily becomes abraded on the upper surface.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

20. IXIAS PYRENE, Linnæus, pl. AA, figs. 29, 30, *gynandromorphous example.*

Papilio pyrene, Linnæus, Mus. Lud. Ulr., p. 241, n. 60 (1764).

The gynandromorphous specimen here figured has been kindly lent to me by Mr. Paul Möwis, by whose native collectors it was obtained in Sikkim. It is not of the usual bilateral form, but the markings of the wings are more or less commingled. Each wing may be thus described:—The forewing on the left-hand side is mostly feminine, and is larger than that on the right-hand side; on its upperside it is normally marked, except that there is a short male orange streak at about the middle of the costa on either side of the base of the first subcostal nervule, but more anterior than posterior to that vein; on the underside this wing is wholly feminine, except a narrow streak of the male yellow coloration along the basal two-thirds of the costa. The hindwing on the left-hand side is mostly masculine, wholly so on the upperside, and is smaller than the opposite wing; on the underside, however, the usual uniform male yellow coloration is broken by a wide discal streak of the sexual feminine white coloration, which commences narrowly at the base of the wing, occupies the posterior half of the discoidal cell, and ends widely near the outer margin. The forewing on the right-hand side is mostly masculine, but the basal anterior quarter of the wing has the normal feminine powdery-black coloration, and there are feminine white streaks invading the masculine orange area; on the underside the coloration is about two-thirds masculine and one-third feminine, there being a very broad band of feminine (white) coloration extending completely across the wing from the base to the outer margin on the anterior half of the wing. The hindwing on the right-hand side is mostly feminine, on the upperside it bears a male narrow discal yellow streak, commencing at the base of the wing in the discoidal cell, broken before the end of the cell, reappearing again in the discoidal interspace for a short distance at its middle, and placed against that vein; on the underside the anterior third of the wing has the ground-colour masculine (yellow), while the posterior two-thirds has it feminine (white).

This curiously commingled gynandromorphous specimen is the first I have seen from Asia. Bilateral monsters seem to occur more frequently, and I recently described such a one in the Journ. A. S. B., vol. lxvi, pt. 2, p. 552, n. 8 (1897), also from Sikkim. Dr. Adolf Fritze in Zool. Jahr., vol. xi, p. 256, pl. xvi, figs. 5*a*, 5*b* (1898), has recently described a very remarkable commingled gynandromorphous example of the summer generation of *Hebomoia glaucippe*, Linnæus, from Okinawa in the Liu-Kiu Islands south of Japan.

Genus Aoa, nov.

Male. Agrees with the genera *Udaiana*, Distant, the type of which is the "*Pieris*" *cynis* of Hewitson, and *Lade*, gen. nov., de Nicéville, the type of which is the "*Appias*" *lalassis* of Grose Smith = "*Pieris*" *indroides* of Honrath, in the abdomen lacking the tuft of long and stiff hairs on each side of the anal valves at their base beneath present in the genus *Appias*, Hübner, of which the genera *Catophaga*, Hübner, *Hiposcritia*, Geyer, *Trigonia*, Geyer, and *Tachyris*, Wallace, are, in my opinion, synonyms. Forewing, differs from *Udaiana* in the *costa* being straighter, the *outer margin* being straight instead of convex ; the *third subcostal nervule* longer ; the *upper discoidal* nervule longer, arising from the subcostal nervure nearer the apex of the discoidal cell ; *discoidal cell* longer ; *disco-cellular* nervules upright instead of being strongly outwardly oblique. Hindwing, *costal nervure* much shorter. Forewing, differs from *Lade* in being broader, the *apex* rounded instead of falcate ; *third subcostal nervule* three times as long. Hindwing, *costa* convex instead of straight. Nearest to *Huphina*, Moore, differing entirely in facies. Forewing, disco-cellular nervules upright instead of outwardly oblique. *Antennæ* in proportion much longer and stouter. *Palpi* longer, especially the third joint. Type, "*Pieris*" *affinis*, Vollenhoven.

(1) Aoa affinis, Vollenhoven.

Pieris affinis, Vollenhoven, Fauna Ent. l'Arch. Indo-Néer., Piérides, p. 40, n. 53, pl. v, fig. 2, *male* (1865) ; id., Wallace, Trans. Ent. Soc. Lond., third series, vol. iv, p. 331, n. 6 (1867) ; id., Hopffer, Stet. Ent. Zeit., vol. xxxv, p. 23, n. 35 (1874) ; *Belenois affinis*, Butler, Proc. Zool. Soc. Lond., 1872, p. 57, n. 41 ; *Huphina affinis*, Rothschild, Iris, vol. v, p. 439 (1892).

Habitat : Celebes.

Dr. A. R. Wallace wrote of this species : "This insect bears such a curious resemblance to the female of *Pieris ithome*, Felder,* that it has always been considered to be the female of a closely-allied species. Owing to its having very small and smooth anal valves I had always considered it to be of that sex ; but having heard that Mr. Watson has found plumules [androconia] on the wing, and therefore pronounced it to be a male, I relaxed my specimens, and by opening the valves found that he was right, and that all the specimens in my own and other collections are males. This being the case, it is evident that it has no close *affinity* whatever with *P. ithome*, or with any other known butterfly, so that its name will be a good example of '*lucus a non lucendo*,' and will serve to recall the error to which its *analogical* resemblance to the female of *P. ithome* gave rise. It must now come in the group of true *Pieris*, and is nearest to *P. rachel*, Boisduval, though forming a distinct subsection." From the synonomy above it will be seen that the type species has been placed in three genera. Wallace correctly located it in *Pieris* group *b*, which equals *Huphina* of Moore, the latter was differentiated many years after Wallace wrote. Rothschild's location is very nearly correct, the present genus being very near to *Huphina*. I have only seen males of this species.

(2) AOA ABNORMIS, Wallace.

Tachyris abnormis, Wallace, Trans. Ent. Soc. Lond., third series, vol. iv, p. 368, n. 14, pl. viii, fig. 5, *female* (1867) ; *Appias abnormis*, Butler, Proc. Zool. Soc. Lond., 1872, p. 48, n. 46 ; *Delias* (*Tachyris* on plate) *abnormis*, Grose Smith and Kirby, Rhop. Ex., pl. *Pierinæ* ii, figs. 6, 7, *female* (*nec* male) (1889); *Pieris abnormis*, Hagen, Jahr. des Nass. Ver. für Natur., vol. l, p. 60, n. 34 (1897).

HABITAT : New Guinea.

Messrs. Grose Smith and Kirby in redescribing and figuring this species say that the specimen figured is a male ; but the figure and description do not agree with a male in my collection from Humboldt Bay, North-West New Guinea, which differs in having the black borders to both wings on the upperside very much narrower, in the forewing fining away to nothing before reaching the anal angle, and in the hindwing being almost reduced to spots between the veins. In their figure also they show and describe two red spots on the underside of the hindwing, which are absent in my specimen. Under *Tachyris euryxantha*, Honrath (*Delias* on plate), plate *Delias* vi, figs. 7,8, *female* (1896), Messrs.

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* From Celebes, placed by Wallace in the same paper (p. 380, n. 47) in the genus *Tachyris*.

Grose Smith and Kirby note: "The German authors regard this species as either a local or seasonal form of *Delias abnormis*, Wallace (see our figure *Tachyris abnormis*, anteà, vol. i, *Pierinæ* pl. ii, figs. 6 and 7; *Delias abnormis* in text, which represents a female and not a male). It may, however, be at once distinguished by the colouring of the under surface. Herr von Mitis points out (Iris, vol. vi, p. 114) that the four-branched [two-branched—L. de N.] subcostal nervure removes both *abnormis* and *euryxantha* from *Delias*." There is no doubt whatever that all the species of the genus *Aoa* are mimics of species of the genus *Delias*, their structure being entirely different from that of *Delias*, as they possess an additional subcostal nervule to the forewing. When Dr. A. R. Wallace described *Tachyris abnormis* he knew only the female; had he known the male he would certainly have put the species in the genus *Pieris*, group *b*.

(3) Aoa euryxantha, Honrath.

Delias abnormis, var. *euryxantha*, Honrath, Berl. Ent. Zeitsch., vol. xxxvi, p. 435 (1891); id., Staudinger, Iris, vol. vii, p. 117 (1894); *Pieris eurixantha* [sic !], Oberthür Etudes d'Ent., vol. xix, p. 6, pl. ii, figs. 9, *male*; 7, *female* (1894); *P. abnormis*, var. *euryxantka*, Hagen, Jahr. des Nass. Ver. für Natur., vol. l, p. 60, n. 35 (1897); *Tachyris* (*Delias* on plate) *euryxantha*, Grose Smith and Kirby, Rhop. Ex., pl. *Delias* vi, figs. 7, 8, *female* (1895).

HABITAT: New Guinea.

In my separata of Honrath's paper that gentleman changed in MS. the generic name of this species from *Delias* to *Appias*. I possess a single female of this species from Stephansort, German New Guinea, which agrees with the published figures. Von Mitis remarks on this species in Iris, vol. vi, p. 114 (1893).

(4) Aoa dohertyi, Oberthür.

Pieris dohertyi, Oberthür, Etudes d'Ent., vol. xix, p. 6, pl. ii, fig. 2, *male* (1894); ? *Pieris dohertyana* [sic !], Grose Smith [sic], Hagen, Jahr. des Nass. Ver. für Natur., vol. l, p. 61, n. 36 (1897).

HABITAT: Ansus in the island of Jobi, Geelwink Bay, North-West New Guinea.

I have not seen this species.

(5) Aoa discus, Honrath.

Delias discus, Honrath, Berl. Ent. Zeitsch., vol. xxx, p. 130, pl. v, fig. 4, *female* (1886).

HABITAT: Sekar, Western New Guinea.

Not seen by me.

(6) AOA QUADRICOLOR, Salvin and Godman.

Pieris quadricolor, Salvin and Godman, Proc. Zool. Soc. Lond., 1877, p. 147, n. 29 pl. xxiii, figs. 3, 4, *male* ; *Pieris* (*Belenois*) *quadricolor*, Pagenstecher, Jahr. des Nass. ver. für Natur., vol. xlvii, p. 71, n. 8 (1894).

HABITAT : Duke of York Island (*Godman* and *Salvin*) ; Mioko, New Guinea (*Pagenstecher*).

I have not seen this species.

(7) AOA DISCOLOR, Mathew.

Pieris discolor, Mathew, Trans. Ent. Soc. Lond., 1887, p. 47.

HABITAT : Ugi, Solomon Islands.

Unknown to me.

Subfamily PAPILIONINÆ.

21. PAPILIO (*Pangerana*) NYX, de Nicéville, pl. AA, fig. 31, ♀.

P. (*Pangerana*) *nyx*, de Nicéville, Ann. and Mag. of Nat. Hist., sixth series, vol. xx, p. 225 (1897).

HABITAT : Bali.

Having recently described this species, I take the opportunity of figuring it here.

Family HESPERIIDÆ.

22. LOTONGUS ONARA, Butler, pl. AA, fig. 32, ♂.

Hesperia onara, Butler, Trans. Ent. Soc. Lond., 1870, p. 498, n. 1 ; idem, id., Lep. Ex , p. 166, n. 1, pl. lix, fig, 11, ? *female* (1874) ; id., Plötz, Stet. Ent. Zeit., vol. xliii, p. 339, n. 120 (1882).

HABITAT : Java.

EXPANSE : ♂, 1·8 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* dark hair-brown. *Forewing* with the following translucent pale yellow spots :—two in the discoidal cell, the anterior one small and rounded, the posterior one placed directly in the middle behind the anterior spot three times as large and elongated ; a minute dot in the subcostal interspace ; a small oval spot towards the base of the second median interspace ; a much larger oval one towards the middle of the first median interspace. *Hindwing* with a large basal and anal luteous area occupying about half the surface of the wing, bearing at the extreme base of the wing a large patch of dark brown setæ. UNDERSIDE, *forewing* dark brown, but the outer and inner margins broadly perceptibly paler ; the translucent spots as on the upperside ; a costal luteous patch immediately anterior to the spots in the cell ; the inner margin as far as the submedian nervure luteous. *Hindwing* dark brown, crossed at the middle by a broad even-edged luteous band, which greatly widens out posteriorly. *Cilia* of the forewing dark brown; of the hindwing anteriorly dark brown, posteriorly luteous. *Antennæ* dark brown, but the base of the club above whitish. *Palpi*, *head*, *thorax* and *abdomen* dark brown, the apex of the latter luteous.

Dr. A. G. Butler has kindly examined the drawing here reproduced, and considers it to represent the hitherto undescribed male of his *Hesperia onara*, the type of which is not in the British Museum, but is in Dr. Butler's opinion probably a female. When describing it he did not state the sex of his type example. He gives the habitat as "East Indies?" The late Herr Plötz recorded both sexes from "India." The male differs from the figure of the female in having five instead of three translucent spots on the forewing, and the basal patch of dark brown setæ on the upperside of the hindwing is more prominent. From the same sex of "*Proteides*" *excellens*, Staudinger,* from Palawan in the Philippines, N.-E. Sumatra, and Pulo Laut, it differs in the luteous area on the hindwing on both surfaces being much larger, and the spots on the forewing being smaller.

Described from a single example kindly sent to me by Herr H. Fruhstorfer, who captured it on Mount Gede in Western Java at an elevation of 4,000 feet in August, 1892.

23. ZEA MYTHECOIDES, n. sp., pl. AA, figs. 33, ♂; 34, ♀.

HABITAT: Bantimoeroeng, South Celebes.

EXPANSE: ♂, 2·0 to 2·1; ♀, 2·2 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining hair-brown. *Cilia* cinereous. *Forewing* with the following translucent white spots:—a narrow transverse one towards the end of the discoidal cell; two or three round subapical dots placed outwardly obliquely; a narrow outwardly-oblique spot towards the base of the second median interspace; a similar one across the middle of the first median interspace. *Hindwing* immaculate. UNDERSIDE, *both wings* dull hair-brown. *Forewing* with the translucent spots as on the upperside; an inwardly-oblique dead white streak across the middle of the submedian interspace, divided into two portions by the submedian fold. *Hindwing* with a large discal dead white patch placed well outside the discoidal cell, its inner and outer edges irregular, especially the latter, commencing just posterior to the costal nervure and ending on the submedian fold. *Antennæ, head, palpi, body*, and *legs* dark brown. FEMALE, *both wings* broader than in the male. UPPERSIDE, *forewing* with the translucent spots similar but larger; four instead of two or three subapical dots, the two posterior ones parallel with the outer margin; an additional oval small opaque pale yellow spot placed anteriorly against the middle of the submedian nervure. *Hindwing* with the base and middle of the wing clothed with long pale ochreous setæ between the veins. UNDERSIDE, *both wings* much as in the male.

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* *Proteides excellens*, Staudinger, Iris, vol. ii, p. 141, pl. ii, fig. 6, *male* (1889); *Lotongus excellens*, de Nicéville and Martin, Journ. A. S. B, vol. lxiv, pt. 2, p. 542, n. 692 (1896); id., Elwes and Edwards, Trans. Zool. Soc. Lond., vol. xiv, p. 233 (1897).

Differs from "*Hesperia*" *mytheca*, Hewitson, the female [?] of which is figured by Distant in Rhop. Malay., p. 377, n. 1, pl. xxxv, fig. 7, *female* (1886), from Malacca, but is found also in Perak and N.-E. Sumatra, in having the translucent spots of the forewing white instead of pale yellow (though Hewitson describes them as white) and more numerous, with an additional white streak in the submedian interspace on the underside of that wing; the discal white patch on the underside of the hindwing is also much smaller and with more irregular edges. From the shape of the wings I should judge the type specimen to have been a male, but Mr. Distant says it is a female. Hewitson when describing it does not give the sex of the same specimen which constitutes the type of the species and genus *Zea*, which latter Messrs. Elwes and Edwards sink under *Lotongus*.

Described from three males and one female received from the capturer, the late Herr C. Ribbe, who calls it "*Pamphila taprobana*," a species unknown to me.

24. ITON AZONA, Hewitson, pl. AA, fig. 35, ♂.

Hesperia azona, Hewitson, Trans. Ent. Soc. Lond., third series, vol. ii, p. 490, n. 11 (1866).

HABITAT: Celebes.

EXPANSE: ♂, 2·3 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* very dark brown or fuscous. *Forewing* with the following translucent lustrous white spots:—three conjoined subapical equal-sized rounded dots, the posteriormost spot nearer the outer margin than the others; a cordate spot towards the base of the second median interspace; a rather larger quadrate spot near the middle of the first median interspace. *Hindwing* with a large oval anal snow-white patch, anteriorly crossed by two veins of the ground-colour. UNDERSIDE, *forewing* marked as on the upperside. *Hindwing* with the anal white area considerably larger than on the upperside, and extending a little way along the abdominal margin. *Cilia* of the forewing fuscous; of the hindwing anteriorly fuscous, posteriorly snow-white. *Antennæ*, *palpi*, *head*, *thorax*, and *abdomen* at the base fuscous; posterior two-thirds of the abdomen snow-white, tipped with fuscous.

At present there are two species only in the genus *Iton**—"*Hesperia*" *semamora*, Moore (=*Hesperia barea*, Hewitson), which has in the male a tuft of hair turned forwards on the underside of the forewing on the sutural area towards the base of the wing, and "*Parnara*" *watsonii*, de Nicéville, which lacks this male secondary sexual character. *I. azona* agrees with the latter in this respect, but differs from both species in having the antennæ very perceptibly longer; the whip-like tip to the crook also longer. In markings it is nearest to *I. semamora*; on the underside, however, the ground-colour is wholly black; in *I. semamora* the costa and apex of the forewing and the hindwing have the ground-colour ochreous; on the hindwing also the white area is very much smaller in *I. azona*. Mr. Hewitson's description of the species is very short, being of four lines only; he gives its expanse as 2 inches, the habitat Macassar. Mr. Francis A. Heron, of the British Museum, has kindly compared the drawing here reproduced with the type, and says that it well agrees therewith.

Described from a single example sent to me by the collector, Herr H. Fruhstorfer, from Patoenoeang or Patanuang in South Celebes.

Genus STIMULA, n. n.

I propose this name for the genus *Watsonia*, Elwes and Edwards, Trans. Zool. Soc. Lond., vol. xiv, p. 220 (1897), which is preoccupied by the Marquis L. de Folin in the *Mollusca* (1879); type "*Watsonia*" *swinhoei*, Elwes and Edwards. I have received a single male of this species from the Khasi Hills from Mr. E. Swinhoe, and two males from Hsipaw, North Shan States, captured by Major F. B. Longe, R.E. Superficially it hardly differs from *Kerana diocles*, Moore, but has the wings narrower, the antennæ shorter, the lower discoidal nervule of the forewing arising slightly nearer to the upper discoidal than to the third median nervule, in *Kerana* this vein arises much nearer to the third median than the upper discoidal nervule, and the second median nervule arising nearer to the third than in *K. diocles.* The type species appears to be confined to the Khasi Hills and Upper Burma. According to Captain E. Y. Watson, this genus would come into Section C of the subfamily *Pamphilinæ*, while the genus *Kerana* comes into Section B, these sections being mainly based on the position of vein 5 (the lower discoidal nervule) of the forewing, *vide* Proc. Zool. Soc. Lond., 1893, p. 70.

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* *Iton*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 399 (1895).

EXPLANATION OF THE PLATES.

PLATE X.

Fig. 1. *Euplœa* (*Crastia*) *core*, Cramer. Upperside ... ♂, p. 131.
„ 2. „ „ „ Underside ... ♂, p. 131.
„ 3. „ (*Trepsichrois*) *linnæi*, Moore. Left-hand upper- and underside ♂, p. 131.
„ 4. „ „ „ „ underside, both wings, neuration ♂, p. 131.
„ 5. *Elymnias* (*Melynias*) *exclusa*, de Nicéville ... ♂, p. 135.
„ 6. „ „ *neolais*, n. sp. ... ... ♀, p. 136.

PLATE Y.

Fig. 7. *Elymnias* (*Melynias*) *laisidis*, de Nicéville ... ♀, p. 137.
„ 8. „ „ *lais*, Cramer ... ... ♀, p. 137.
„ 9. *Mycalesis* (*Physcon*) *pandæa*, Hopffer ... ... ♂. p. 134.
„ 10. *Discophora deo*, n. sp. ... ... ♂, p. 137.
„ 11. *Cethosia narmadoides*, de Nicéville ... ... ♂, p. 138
„ 12. *Rhinopalpa callonice*, Fruhstorfer ... ... ♂, p. 139.

PLATE Z.

Fig. 13. *Charaxes keianus*, Rothschild ... ... ♂, p. 140.
„ 14. „ „ „ ... ... ♀, p. 140.
„ 15. *Gerydus longeana*, n. sp. ... ... ♂, p. 141.
„ 16. „ „ „ ... ... ♀, p. 141.
„ 17. *Logania watsoniana*, n. sp. ... ... ♂, p. 143.
„ 18. „ „ „ ... ... ♀, p. 143.

PLATE Z—*contd.*

Fig. 19. *Cyaniris cara*, n. sp. ... ... ♂, p. 143
„ 20. „ „ „ ... ... ♀, p. 143
„ 21. *Lampides lunata*, n. sp. ... ... ♂, p. 145
„ 22. „ „ „ ... ... ♀, p. 145
„ 23. *Lycænesthes turneri*, Miskin ... ... ♂, p. 146
„ 24. „ „ „ ... ... ♀, p. 146
„ 25. *Hypothecla honos*, n. sp. ... ... ♀, p. 150
„ 26. *Camena cameria*, n. sp. ... ... ♂, p. 148

PLATE AA.

„ 27. *Deudorix gætulia*, de Nicéville ... ... ♀, p. 148
„ 28. *Zinaspa zana*, n. sp. ... ... ♀, p. 149
„ 29. *Ixias pyrene*, Linnæus. Upperside. Gynandromorphous example. p. 152
„ 30. „ „ „ Underside „ p. 152
„ 31. *Papilio (Pangerana) nyx*, de Nicéville ... ... ♀, p. 156
„ 32. *Lotongus onara*, Butler ... ... ♂, p. 156
„ 33. *Zea mythecoides*, n. sp. ... ... ♂, p. 157
„ 34. „ „ „ ... ... ♀, p. 157
„ 35. *Iton azona*, Hewitson ... ... ♂, p. 158

THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Professor of Botany,
College of Science, Poona.

Part V.

(*Continued from page* 651 *of Vol. XI.*)

LXXIX.—Goodenovieæ.

1. *Scævola.*

S. kœnigii, *Vahl.*, F.B.I.—III-421. *Bhadruk.* Ratnagiri. June-Dec.
S. lobelia, *Linn.*, F.B.I.—III-421. Karachi.

LXXX.—Campanulaceæ.

Isotoma (*Extra Indian*).

I. longiflora, *Presl.*, prod. lob. *f.* 42. Garden weed. Aug.-Sept.

2. *Lobelia.*

L. trigona, *Roxb.*, F.B.I.—III-423. Panchgani, Narel. Aug.
L. trialata, *Ham.*, F.B.I.—III-425. Ambeghat. Mahabl. July-Nov.
L. nicotianifolia, *Heyne*, F.B.I.—III-427. *Dawal, Bokenul.* W. Ghats. Jan.

3. *Cephalostigma.*

C. Schimperi, *Hochs.*, F.B.I.—III-428. Panchgani, Adur. Dharwar. Nov.-Dec.
C. flexuosum, *H.-f. & T.*, F.B.I.—III-428. Birchi, N. Kanara. Nov.

4. *Wahlenbergia.*

W. gracilis, *DC.*, F.B.I.—III-429. *Kerdi.* Lanauli. Khandala. Feb.

11. *Sphenoclea.*

S. zeylanica, *Gært.*, F.B.I.—III-438. Vingorla. Kalyan. Bubak, Sind, Oct.-Dec.

13. *Campanula.*

C. Alphonsii, *Wall.*, F.B.I.—III-440. Shinghad. Dang. Oct.

LXXXVI.—Plumbagineæ.

3. *Statice.*

S. Stocksii, *Boiss.*, F.B.I.—III-480. Verawal, Sind. Dec.

4. *Plumbago.*

P. zeylanica, *Linn.*, F.B.I.—III-480. *Chitrak.* Deccan Hills. Aug.-Sept.
P. rosea, *Linn.*, F.B.I.—III-481. *Lal chitrak.* Cultivated.
P. capensis, *Thunb.*, prod. fl. cap.—I-83. *Kala chitrak.* Cult. May-Dec.

6. *Vogelia.*

V. indica, *Gibson.*, F.B.I.—III-481. Abu. Porebunder. Dec.

LXXXVII.—Primulaceæ.

7. *Anagallis.*

A. arvensis, *Linn.*, F.B.I.—III-506. Deccan, widely. Sept.-Dec.

8. *Centunculus.*

C. tenellus, *Duby.*, F.B.I.—III-506. Poona. Aug.

LXXXIII.—MYRSINEÆ.

1. *Mœsa.*

M. indica, *Wall.*, F.B.I.—III-509. *Aitan.* Mahableshwar. Dec.-Jan.

2. *Myrsine.*

M. capitellata, *Wall.*, F.B.I.—III-512. Santaveri. Dec.

3. *Embelia.*

E. Ribes, *Burm.*, F.B.I.—III-573. *Waiwarung.* W. Ghats.

E. robusta, *Roxb.*, F.B.I.—III-515. *Ambati.* Katrir Ghat Aug-Apl.

E. viridifolia, *Scheff.*, F.B.I.—III-516. *Ambut.* Oct.-Jan.

5. *Ardisia.*

A. humilis, *Vahl.*, F.B.I.—III-529. *Bugdi, Dikna.* Castle Rock. Ambooli. Aug.-Dec.

10. *Ægiceras.*

Æ. majus, *Gaertn.*, F.B.I.—III-533. *Kanjala.* Mombra, near Thana. Feb.

LXXXIX.—SAPOTACEÆ.

1. *Chrysophyllum.*

C. Roxburghii, *G. Don.*, F.B.I.—III-538. *Tarsi, Dongri myphul.* Khandalla. Aug.

3. *Sideroxylon.*

S. tomentosum, *Roxb.*, F.B.I.—III-538. *Katekumbal.* Mahabl. Matheran. Jan.

Achras.

A. sapota, *Linn.*, *DC.* Prod.—VIII-173. *Chikoo.* Cultivated.

5. *Dichopsis.*

D. elliptica, *Benth.*, F.B.I.—III-542. *Pânchoti pâllâ.* Bombay. Kanara. *Dalzell.*

6. *Bassia.*

B. latifolia, *Roxb.*, F.B.I.—III-544. *Mowha.* Khandalla. Peint Taluk, Guzerat, widely. Mar.-May.

B. longifolia, *Linn.*, F.B.I.—III-544. *Ippi, Mowha.* Suligeri, N. Kanara. Jan.

B. malabarica, *Bedd.*, F.B.I.—III-544. Sumpkund, N. Kanara. Feb.

8. *Mimusops.*

M. elengi, *Linn.*, F.B.I.—III-548. *Bakuli.* Divimana Ghat. Feb.

M. Hexandra, *Roxb.*, F.B.I.—III-549. *Khirni.* Jooneer. Godra. Sept.-Oct.

XC.—EBENACEÆ.

1. *Maba.*

M. nigrescens, *Dazl.*, F.B.I.—III-551. *Dolali.* Ambooli Ghat, in fruit. Nov.

M. micrantha, *Hiern.*, F.B.I.—III-552. Syhadree. *Dalzell.*

2. *Diospyros.*

D. pruriens, *Dalz.*, F.B.I.—III-553. Chorla Ghat. *Dalz.* Cool season.

D. montana, *Roxb.*, F.B.I.—III-555. *Govindu.* Near Panwell.

D. kaki, *Linn.*, F.B.I.—III-555. *Kaki.* Cultivated Bombay, rarely.

D. embryopteris, *Pers.*, F.B.I.—III-556. *Timburi.* Salsette,

D. ebenum, *Koenig.*, F.B.I.—III-585.

D. assimilis, *Bedd.*, F.B.I.—III-558. *Abnus, Malia.*

D. sylvatica, *Roxb.*, F.B.I.—III-559. Thana. Matheran (Telgiri, *Talbot*) Feb.

D. microphylla, *Bedd.*, F.B.I.—III-559. Yellapur. Mar.

D. chloroxylon, *Roxb.*, F.B.I.—III-560. *Ninie.* Peint Road, 6 miles N. of Nasik, in fruit. Apl.

D. oocarpa, *Thwaites.*, F.B.I.—III-560. Divimana. Thana. Feb.

D. tupru, *Buch.-Ham.*, F.B.I.—III-563. *Temburni.* Behar Tank, in fruit. June.

D. paniculata, *Dalz.*, F.B.I.—III-570. Chorla Ghat and Raighur. Cool season. *Dalz.* Devimana. Feb.

XCI.—Styraceæ.

1. *Symplocos.*

S. spicata, *Roxb.*, F.B.I.—III-573. Castle Rock. Oct-Dec.

S. Beddomei, *C.B.C.*, F.B.I.—III-582. *Lenda, Lodhra.* Mahableshwar. Jan.

XCII.—Oleaceæ.

1. *Jasminum.*

J. sambac, *Ait.*, F.B.I.—III-591. *Mogra.* Gardens.

J. pubescens, *Wild.*, F.B.I.—III-592. *Ran Mogra.* Mombra, near Thana. Feb.

J. arborescens, *Roxb.*, F.B.I.—III-594. *Kusar, Kundî.* Chaudawar. Aug.

J. Ritchiei, *Clarke*, F.B.I.—III-598. Castle Rock. Chandawar, N. Kanara. Aug.

J. auriculatum, *Vahl.*, F.B.I.—III-600. Badami. Nov.

J. flexile .*Vahl.*, F.B.I.—III-601, Kumpta to Sirsi Road. Mar.

J. officinale, *Linn.*, F.B.I.—III-603. *Jai.* Cultivated.

2. *Nyctanthes.*

N. arbortristis, *Linn.*, F.B.I.—III-603. *Sirali, Parajatak.* Pal jungles. Aug.

3. *Schrebera.*

S. swietenioides, *Roxb.*, F.B.I.—III-604. *Mohka.* Bhowdan. Poona. Samasgi. Dharwar. Apl.-May.

6. *Osmanthus.*

O. fragrans, *Lour.*, F.B.I.—III-606. Gardens. Cultivated.

7. *Linociera.*

L. malabaricum, *Wall.*, F.B.I.—III-607 *Haedi.* Lanauli. Amba Ghat. Nov.-Apl.

L. intermedia, *Wight.*, F.B.I.—III-609. Lanauli. Apl.
var. Roxburghii.

8. *Olea.*

O. dioica, *Roxb.*, F.B.I.—III-612. *Parjamb, Karambu.* Khandalla. Jan.-May.

O. cuspidate, *Wall.*, F.B.I.—III-612. *Bahu, Kan, Shwan.* Planted.

9. *Ligustrum.*

L. neilgherriense, *Wight.*, F.B.I.—III-615. Mahableshwar. Aug.-Oct.

XCIII.—Salvadoraceæ.

2. *Salvadora.*

S. persica, *Linn.*, F.B.I.—III-619. *Pilra, Kakhana.* Gogo. Bijapur. Bulsar. Dec.-Feb.

S. oleoides, *Dcne.*, F.B.I.—III-620. *Khabbur jhar, Diar.* Nadiad. Sind. Jan.

3. *Azima.*

A. tetracantha, *Linn.*, F.B.I.—III-620. *Sukkaput, Kundali.* Badami. Adur. Dharwar.

XCIV.—APOCYNACEÆ.

6. *Carissa.*

C. carandas, *Linn.*, F.B.I.—III-630. *Karwand.* Karavanta. Khandalla. Feb.-Mar.
C. spinarum, *A.D.C.*, F.B.I.—III-631. Badami. May-June.
C. macrophylla, *Wall.*, F.B.I.—III-631. Hills near Karwar. Jan.-Feb.
C. sauvissima, *Bedd.*, F.B.I.—III-631. N. Kanara. *Talbot.* Jan.-Feb.

7. *Rauwolfia.*

R. serpentina, *Benth.*, F.B.I.—III-632. *Hadaki.* Castle Rock. Aug.-Jan.
R. densiflora, *Benth.*, F.B.I.—III-633. Mahableshwar.

Thevetia.

T. neriifolia, *Juss. DC.* Prod.—VIII. 343. *Peoli Kunnar.* Planted. Jan.-Aug.

10. *Cerbera.*

C. odollam, *Gaertn.*, F.B.I.—III-638. *Odolam, Sukanu.* *Anant.* S. Konkan. June-Jan.

13. *Rhayza.*

R. stricta, *D.C.N.*, F.B.I.—III-640. *Sewar, Sihariswarg.* Sehwan, Sind. Dec.

14. *Vinca.*

V. pusilla, *Murr.*, F.B.I.—III-640. *Sangkhi. Sankaphi.* Poona. Guzerat, widely. June-Sept.
V. rosea, *Linn.*, *sp. pl.*—305. *Sadafuli, Baromashi.* Cultivated.

14. *Plumeria.*

P. acutifolia, *Poir.*, F.B.I.—III-641. *Keir champa.* Cultivated.
P. alba, *Linn.*, *DC.* Prod.—VIII-392. Cultivated.

16. *Alstonia.*

A. scholaris, *Brown.*, F.B.I.—III-642. *Satavin.* Near Lanauli.
A. macrophylla, *Wall.*, F.B.I.—III-643. Cultivated.

18. *Holarrhena.*

H. antidysenterica, *Wall.*, F.B.I.—III-644. *Dowla kuda, Indrajar.* Khandala. Mar.

19. *Tabernæmontana.*

T. Heyneana, *Wall.*, F.B.I.—III-646. *Nagal Kuda.* Sirsi. Apl.
T. coronaria, *Br.*, F.B.I.—III-646. *Taggar.* Cultivated.
T. crispa, *Roxb.*, F.B.I.—III-448. *Nag kuda.* Matheran. Castle Rock. Marmagoa.

20. *Parsonsia.*

P. spiralis, *Wall.*, F.B.I.—III-650. April.

21. *Vallaris.*

V Heynei, *Spr.*, F.B.I.—III-650. Jagalput. N. Kanara. Feb.-Mar.

23. *Wrightia.*

W. tinctoria, *Br.*, F.B.I.—III-653. *Kalu kuda.* W. Ghats, Thana. May-June.
W. tomentosa, *Roem. & Schult.*, F.B.I.—III-653. Dang. Sawantwady.

24. *Nerium.*

N. odorum, *Soland.*, F.B.I.—III-655. *Kanher.* Deccan. Sind, widely planted. Apl.-Mar.

Roupellia.

R. grata, *Wall.*, Bot. Mag. 4466. Gardens. Mar.

29. *Beaumontia*

B. grandiflora, *Wall.*, F.B.I.—III-660. Cult. Dec.-Feb.

B. Jerdoniana, *Wight.*, F.B.I.—III-661. N. Kanara. Nov.-Dec.

30. *Chonemorpha.*

C. macrophylla, *G. Don.*, F.B.I.—III-661. Divimana. May.

33. *Aganosma.*

A. caryophyllata, *G. Don.*, F.B.I.—III-664. *Malati, Kemettivalli.* Ganeshkhind. Gardens. Aug.

37. *Anodendron.*

A. paniculatum, *A. D. C.*, F.B.I.—III-668. *Lamtani.* Lonauli. Dec.-Mar.

38. *Ichnocarpus.*

I. frutescens, *Br.*, F.B.I.—III-669. *Kristnasarwa, kantebouri.* Castle Rock. Sirsi. Nov.-Dec.

Adenium.

A. obesum, *Rœm. et Sch.*, *DC.* Prod.V.—III-412. *Adenachakanher.* Poona. Cult. Mar.-Apl.

XCV.—ASCLEPIADEÆ.

2. *Hemidesmus.*

H. indicus, *Br.*, F.B.I.—IV-5. *Upalsari, Anantamul, Dudhbali.* Vingorla. Poona. Sumpkund. Oct.

3. *Cryptolepis.*

C. Buchanani, *Rœm.*, F.B.I.—IV-5. *Karanta.* Deccan, widely. Aug.

3.* *Cryptostegia.*

C. grandiflora, *Br.*, F.B.I.—IV-6. *Vilayati vakundi.* Naturalised, widely. June-Sept.

13. *Periploca.*

P. aphylla, *Dcne.*, F.B.I.—IV-12. *Ransher.* Thano Bullo Khan, Sind. In fruit, Nov.

16. *Genianthus.*

G. laurifolius, *Hook. f.*, F.B.I.—IV-16. N. Kanara Ghats. *Talbot.* Dec.

17. *Glossonema.*

G. varians, *Benth.*, F.B.I.—IV-16. Sind. Dec.

18. *Oxystelma.*

O. esculentum, *Br.*, F.B.I.—IV-17. *Dudhi, Dudhani.* Poona. Sind. Dec.

19. *Calotropis.*

C. gigantea, *Br.*, F.B.I.—IV-17. *Mandar, Rui.* Deccan. Guzerat, widely. Feb.-July.

C. procera, *Br.*, F.B.I.-IV—18. *Bandar, Rui.* Poona, Sind, widely. Dec.

19. *Asclepias.*

A. curassavica, *Linn.*, F.B.I.—IV-18. Kurki. Poona. Kumta. Feb.-Dec.

22. *Pentatropis.*

P. spiralis, *Dcne.*, F.B.I.—IV-19. *Ambarvels singarsta.* Lasalgaon. Hajam. Sind. Feb.-Nov.

P. microphylla, *Wight.*, F.B.I.—IV-20. *Parparum.* Dango. Gokak.

23. *Dœmia.*

D. extensa, *Br.*, F.B.I.—IV-20. *Utarana.* Poona. Sind. Aug.-Dec.

25. *Holotsemma.*

H. Rheedei, *Wall.*, F.B.I —IV-21. *Tultuli shindori.* Narel. Aug.

26. *Cynanchum.*

C. pauciflorum, *Br.*, F.B.I.—IV-23. Jooner. Oct.-Feb.

C. callialata, *Ham.*, F.B.I.—IV-24. Poona. Haveri. Apl.

27. *Sarcostemma.*

S. brevistigma, *Wight.*, F.B.I.—IV-26. *Konagulli. Somalata.* Poona. June, July.

30. *Gymnema.*

G. sylvestre, *Br.*, F.B.I.—IV-29. Kavali. *Shiru-kurunja.* Mahabl. Sumpkund, N. Kanara. Apl.

G. pergularioides, *Wt. & Gard.*, F.B.I.—IV-32. Haveri. Apl.

32. *Marsdenia.*

M. tenacissima, *Wight. & Arn.*, F.B.I.—IV-34. Champaneer. Poona. May.

33. *Pergularia.*

P. pallida, *Wight. & Arn.*, F.B,I.—IV-38.

P. minor, *Andr.*—F.B.I.—IV-38. Cultivated.

34. *Stephanotis.*

S. grandiflora, *DC.*, Prod.—VIII-620. (Madagascar.) Gardens.

36. *Tylophora.*

T. fasciculata, *Ham.*, F.B.I.—IV-40. *Bhindodi.* Wandra. Bank of Tansa Canal. Aug.

T. rotundifolia, *Ham.*, F.B.I.—IV-43. Londa. June.

T. Dalzelli, *Hook. f.*, F.B.I.—IV-43. Konkan. *Stocks, Law.*

T. asthmatica, *Wight.*, F.B.I.—IV-44. *Jungli pikwan, Karaki rasna.* Lanauli Gokak. Nov.

38. *Cosmostigma.*

C. racemosa, *Wight.*, F.B.I.—IV-46. *Jati, Marvel, Shendari. Shendvel.* Konkan & N. Kanara. *Talbot.* June-Aug.

39. *Dregea.*

D. volubilis, *Benth.*, F.B.I.—IV-46. Mawal. Poona. Apl.

Do. var. augustifolia. Lohagaum. Poona. July.

42. *Oianthus.*

O. urceolatus, *Benth.*, F.B.I.—IV-49. Poona. Aug.

44. *Hoya.*

H. retusa, *Dalz.*, F.B.I.—IV-56. Yacombi, N. Kanara. July

H. Wightii, *Hook. f.*, F.B.I.—IV-59. Sumpkund, do. do.

H. pendula, *Wight.*, F.B.I.—IV-61. Near Nagotna. *Dalzell.*

47. *Leptadenia.*

L. reticulata, *Wt. & Arn.*, F.B.I.—IV-63. *Nakshikani. Harandori.* Deccan. Apl.
L. spartium, *Wight.*, F.B.I.—IV-64. *Kip* (Sind). Sind, Mandwee. Dec.

50. *Ceropegia.*

C. attenuata, *Hook.*, F.B.I.—IV-67. Hills near Jooneer. Sept.
C. Lawii, *Hook. f.*, F.B.I.—IV-67. *Kandtori.* Khandalla. Poorundhur. Aug.-Sept.
C. bulbosa, *Roxb.*, F.B.I.—IV-67. 10 miles, W. Poona. Aug.
C. juncea, *Roxb.*, F.B.I.—IV-68. *Kunwal.* Badami. Aug.
C. acuminata, *Roxb.*, F.B.I.—IV-70. Pasham. Aug.
C. hirsuta, *W. & A.*, F.B.I.—IV-71. Var. Jacquemontiana. *Hamana.* Poona. Aug.

51. *Frerea.*

F. indica, *Dalz.*, F.B.I.—IV-76. *Shindal makudi.* Hill Fort, Jeener. Sept.-Oct.

(*A fleshy glabrous herb or undershrub* 4″—6″. *Flowers* ¾″ *diam.*)

52. *Caralluma.*

C. edulis, *Benth.*, F.B.I.—IV-76. Mulir, 6 miles from Karachi. Sept.
C. fimbriata, *Wall.*, F.B.I.—IV-77. *Makadasingi.* Deccan hills, widely. May-June.

XCVI.—LOGANIACEÆ.

1. *Mitreola.*

M. oldenlandioides, *Wall.*, F.B.I.—IV-79. Pali. Konkan. In fruit, Oct.

3. *Buddleia.*

B. asiatica, *Lour.*, F.B.I.—IV-82. Fitzgerald Ghat. Jan.

4. *Fagraea.*

F. obovata, *Wall.*, F.B.I.—IV-83. Sumpkund, N. Kanara. July

6. *Strychnos.*

S. colubrina, *Linn.*, F.B.I.—IV-87. *Kanal. Kajarbel.* Tunia Ghat. *Talbot.*
S. Dalzellii, *Clarke*, F.B.I.—IV-87. Southern Ghat. *Dalzell.*
S. nux-vomica, *Linn.*, F.B.I.—IV-90. *Kajra, Kasarkano.* Ratnagiri. Mar.
S. potatorum, *Linn.*, F.B.I.—IV-90. *Nermali.* Pal jungles. In fruit, Feb.

XCVII.—GENTIANEÆ.

2. *Exacum.*

E. bicolor, *Roxb.*, F.B.I.—IV-96. *Cowrie, Bara karait.* Mawal. Poona. Sept.
E. pedunculatum, *Linn.*, F.B.I.—IV-97. Mawal. Poona. Dharwar. Dec.
E. Lawii, *Clarke*, F.B.I.—IV-98. Mahableshwar. Oct.
E. petiolare, *Grisb.*, F.B.I.—IV-98. Matheran. Sept.

4. *Hoppea.*

H. fastigiata, *Clarke*, F.B.I.—IV-100. Ravor. Khandesh. Poona. Oct.

5. *Enicostema.*

E. littorale, *Bl.*, F.B.I.—IV-101. *Choti karait, Kadvanai.* Sind. Guzerat. Dharwar. Oct.

6. *Erythrœa.*

E. Roxburghii, *G. Don.*, F.B.I.—IV-102. *Luntak.* Konkan. Deccan. Feb.-Apl.

7. *Canscora.*

C. diffusa, *Br.*, F.B.I.—IV-103. Konkan. Deccan widely. Oct.

C. decurrens, *Dalz.*, F.B.I.—IV-103. Poona. Kumta. Oct.-Nov.

C. concanensis, *Clarke*, F.B.I.—IV-104. Narel. Aug.

C. perfoliata, *Lamk.*, F.B.I.—IV-104. Karwar. Feb.

12. *Swertia.*

S. tetragona, *Clarke*, F.B.I.—IV-122.

S. corymbosa, *Wight.*, F.B.I.—IV-126. *Hullihal.* Castle Rock. Nov.

S. decussata, *Nimmo*, F.B.I.—IV-127. *Kadu, Kavadi.* Panchgani. Nov. Jan.

15. *Limnanthemum.*

L. cristatum, *Grisb.*, F.B.I.—IV-131. *Kumudini.* Ponds. Deccan. Concan. Apl.-Sept.

L. indicum, *Thwaites*, F.B.I.—IV-131. *Kumud.* Guzerat. Mawal. Apl.-Sept.

XCIX. HYDROPHYLLACEÆ.

1. *Hydrolea.*

H. zeylanica, *Vahl.*, F.B.I.—IV-133. *Popti, Keriti.* Mahad, Bulsar. Nov.-Dec.

C. BORAGINEÆ.

1. *Cordia.*

C. Myxa, *Linn.*, F.B.I.—IV-136. *Bokara, Gondani.* Sakkar Pathar, Deccan. Mar.-Apl.

C. obliqua, *Willd.*, F.B.I.—IV-137. *Mota lusura.* Londa. In fruit June.

C. monoica, *Roxb.*, F.B.I.—IV-137. Badami. Aug.

C. Rotthii, *Roem. Sch.*, F.B.I.—IV-138. *Gondana.* Deesa. Deccan widely. Nov.

C. MacLeodii, *H. . & T.*, F.B.I.—IV-139. *Dhaivana.* Mawal. Mar.

2. *Ehretia.*

E. lævis, *Roxb.*, F.B.I.—IV-141. *Dataranga.* Karwar. Malshiras. Bhowdan. Poona. Mar.

3. *Coldenia.*

C. procumbans, *Linn.*, F.B.I.—IV-144. *Tripakshi, Tripanki.* Badami. Lanauli. Oct.

4. *Rhabdia.*

R. lycioides, *Mart.*, F.B.I.—IV-145. *Machim.* Deccan. N. Kanara streams. Oct.-Dec.

6. *Heliotropium.*

H. zeylanicum, *Lamk.*, F.B.I.—IV-148. Deesa. Badami. Karachi. Nov.-Jan.

H. ophioglossum, *Stocks*, F.B.I.—IV-149. Sind.

H. supinum, *Linn.*, F.B.I.—IV-149. Singhur. Poona. Dharwar. Mar.

H. calcareum, *Stocks*, F.B.I.—IV-150. Sehwan. Hyderabad. Dec.

H. ovalifolium, *Forsk.*, F.B.I.—IV-150. Penn. Poona. Jan.-Feb.

H. undulatum, *Vahl.*, F.B.I.—IV-150. Karachi. Hyderabad, Sind. Dec.

H. Rottleri, *Lehm.*, F.B.I.—IV-151. *Daorfuli.* Sind.

H. paniculatum, *Br.*, F.B.I.—IV-151. Sind.

H. indicum, *Linn.*, F.B.I.—IV-152. *Burundi.* Ajeru Salt swamp, Bombay. Oct.-Nov.

H. peruvianum, *Linn.*, *Sp.* 189. Gardens.

7. *Trichodesma.*

T. indicum, *Br.*, F.B.I.—IV-153. *Katha mendha.* Kalyan. Aug.-Sept.

T. amplexicaule, *Roth.*, F.B.I.—IV-153. Bijapur. Mulier, Sind. Aug.-Jan.

T. africanum, *Br.*, F.B.I.—IV-154. Bulo Khan, Luki, Sind. Aug.

T. zeylanicum, *Br.*, F.B.I.—IV-154. Badami. Baroda. Sidashyagad. N. Kanara. Jan.

10. *Cyanoglossum.*

C. lanceolatum, *Forsk.*, F.B.I.—IV-156. *Lichardi.* Poona. Panchgani. Oct.

13. *Parycaryum.*

P. cælestinum, *Benth.*, F.B.I.—IV-160. Mahableshwar. Oct.

P. malabaricum, *Clarke*, F.B.I.—IV-160. *Kala lichardi.* Mahableshwar. Oct.

P. Lambertianum, *Clarke*, F.B.I.—IV-161. Mahableshwar. Oct.

P. asperum, *Stocks.* Khirtur Mts. *H.E.M. James.*

29. *Sericostoma.*

S. pauciflorum, *Stocks*, F.B.I.—IV-176. Broach. Palanpur. Veraval. Nov.-Dec.

30. *Arnebia.*

A. hispidissima, *DC.*, F.B.I.—IV-176. Mulier, Sind. Palanpur. Mar.

CI.—CONVOLVULACEÆ.

1. *Erycibe.*

E. paniculata, *Roxb.*, *var.* Wightiana, F.B.I.—IV-180. Castle Rock. Nov.

Legendrea. (Canary Islands.)

L. mollissima, *Webb.*, *DC.* Prod.—IX-328. Naturalised. Poona. Oct.

2. *Rivea.*

R. ornata, *Chois.*, F.B.I.—IV-183. Mawal. Poona. Sept.

R. hypocrateriformis, *Chois.*, F.B.I.—IV-184. *Phanji.* Mawal. Poona. Sept.

3. *Argyreia.*

A. speciosa, *Sweet.*, F.B.I.—IV-185. *Samudrasoke.* Gardens, Poona, Broach. Aug.

A. involucrata, *Clarke*, F.B.I.—IV-187. Collem. Wadi, near Mahableshwar. Oct.

A. involucrata *var.* inequalis. Marmagoa. Oct.

A. sericea, *Dalz.*, F.B.I.—IV-188. Dasgaon. Matheran. Aug.-Sept.

A. malabarica, *Chois.*, F.B.I.—VI-189. Mahableshwar. Aug.

A. pilosa, *Arn.*, F.B.I.—IV-189. Yellapur. Sept.

A. cymosa, *Sweet.*, F.B.I.—IV-189. W. Ghat.

A. cimeata, *Ker.*, F.B.I.—IV-191. *Mahalungi.* Hills near Poona. July-Aug.

4. *Lettsomia.*

L. aggregata, *Roxb.*, F.B.I.—IV-191. Devikope. Samasgi. Dharwar. Dec.-Jan.
L. elliptica, *Wight.*, F.B.I.—IV-192. *Bondwel.* Mahableshwar. Sept.
L. setosa, *Roxb.*, F.B.I.—IV-194. Narel. Aug.

5. *Ipomœa.*

I. bonanox, *Linn.*, F.B.I.—IV-197. *Gulachandani.* Cultivated.
I. muricata, *Jacq.*, F.B.I.—IV-197. Katriz. Poona. Sept.
I. grandiflora, *Lamk.*, F.B.I.—IV-198. Cultivated.
I. trichosperma, *Blume*, F.B.I.—IV-198. Dharumpter. Cult.? Sept.
I. coccinea, *Linn.* F.B.I.—IV-198. Cultivated
I. Quamoclit, *Linn.*, F.B.I—IV-198. *Ganesh Pushpa.* Cultivated
I. hederacea, *Jacq.*, F.B.I.—IV-199. Cultivated
I. laciniata, *Clarke*, F.B.I.—IV-200. Sawantwadi. Aug.
I. dissecta, *Willd.*, F.B.I.—IV-200. Panchgani. Mahableshwar. Oct.
I. calycina, *Benth.*, F.B.I.—IV-201. Surat. Poona., Satara Rd. 25th mile. Oct.
I. barlerioides, *Benth.*, F.B.I.—IV-201. Sirsi. Sept.
I. digitata, *Linn.*, F.B.I.—IV-202. Kalyan.
I. pentaphylla, *Jacq.*, F.B.I.—IV-202. Pal jungle. Baroda. Feb.
I. batatas, *Lamk.*, F.B.I.—IV-202. *Ritala, Kanangi.* Sweet potato. Cult.
I. pileata, *Roxb.*, F.B.I.—IV-203. Sawantwadi. Nov.
I. pestigrides, *Linn.*, F.B.I.—IV-204. Ghat between Khad and Path. Sept.
I. eriocarpa, *Br.*, F.B.I.—IV-204. *Kandoakle.* Kanali, Guzerat. Poona. Sept.
I. sindica, *Staph.*, Kew Bull. Near Karachi.
I. Stocksii, *Clarke*, F.B.I.—IV-204. Deccan. Penil. *Stocks.*
I. angustifolia, *Jacq.*, F.B.I.—IV-205. Karwar, Londa. Aug.-Dec.
I. tridentata, *Roth.*,—F.B.I. IV-205. *Morga. Sendar Kalandi.* Nariad. Shrewardan. Oct.
I. chryseides, *Ker.*, F.B.I.—IV-206. Dakor, Guzerat. Nov
I. reniformis, *Chois.*, F.B.I.—IV-106. *Undirkani.* Poona. Deccan widely.
I. rumicifolia, *Chois.*, F.B.I.—IV-207. Karachi. Dec.
I. obscura, *Ker.*, F.B.I.—IV-207. *Pungali.* Badami. Poona. Guzerat. Oct.-Jan.
I. Clarkei, *Hook.*, *f.*, F.B.I.—IV-207. Near Jooneer. Sept.
I. sepiaria, *Koen.*, F.B.I.—IV-209. *Ambti-vel.* Gokak Porebunder. Oct.
I. aquatica, *Forsk.*, F.B.I.—IV-210. *Nalichi baji. Takasi.* Poona. Deccan widely. Nov.-Apl.
I. staphylina, *Roem. & Sch.*, F.B.I.—IV-210. Byadgi. Dec.
I. campanulata, *Linn.*, F.B.I.—IV-211. *Tambarwail.* Mawal, Poona. Dharwar. Sept.-Jan.
I. cymosa, *Roem. & Sch.*, F.B.I.—IV-211. Ambeghat. Jan.
I. turpethrum, *Br.*, F.B.I.—IV-212. *Bursingali Nisottar. Phutkari.* Revadanda. Oct.-Jan.
I. biloba, *Forsk.*, F.B.I.—IV-212. *Maryadvel.* Guzerat shores. Feb.

I. vitifolia, *Sweet*, F.B.I.—IV-213. *Navli.* Castle Rock. Vingorla. Oct.-Nov.

I. pilosa, *Sweet*, F.B.I.—IV-213. Ahmedabad. Dec.

I. sinuata, *Orteg.*, F.B.I.—IV-214. Guzerat. Nov.

I. rhyncorhiza, *Dalz.*, F.B.I.—IV-214. Huttigherry, N. Kanara. July.

I. palmata, *Forsk.*, F.B.I.—IV-214. Badami.

I. dasysperma, *Jacq.*, F.B.I.—IV-215. Garden escape. Poona. Porebunder. Sept.-Nov.

I. tuberosa, *Linn.*, *DC.* Prod., IX-362. Gardens.

I. carnea, *Jacq.*, *Am.*, 26, *t.* 18. Cult. Gardens.

I. Horsfalliæ, *Hook.*, *Bot. Mag.*-3315. Cult. Gardens.

7. *Hewittia.*

H. bicolor, *Wight.*, F.B.I.—IV-216. Sawantwadi. Marmagoa. Nov.

9. *Convolvulus.*

C. sindicus, *Stocks*, F.B.I.—IV-217. 12 miles east of Bullo Khan, Sind. Aug.

C. microphyllus, *Sieb.*, F.B.I.—IV-218. Hyderabad, Milir, Sind. Oct.

C. rhyncospermus, *Hochst.*, F.B.I.—IV-218. Sind. Oct.

C. glomeratus, *Chois.*, F.B.I.—IV-219. Karachi. Porebunder. Dec.

C. Rottlerianus, *Chois.*, F.B.I.—IV-219. Lenyadri. Jooneer. Sept.

C. arvensis, *Linn.*, F.B.I.—IV-219. *Hiranpag. Chandwel.* Jeur. Poona. Karachi. Dec.-Feb.

C. parviflorus, *Vahl.*, F.B.I.—IV-220. Dongargaun, near Ahmednagar. Chandod, Guzerat. Nov.

10. *Evolvulus.*

E. alsinoides, *Linn.*, F.B.I.—IV-220. *Visnukránta, Sankaveli.* July-Nov.

11. *Porana.*

P. paniculata, *Roxb.*, F.B.I.—IV-222. Bridal creeper. Gardens. Sept.-Oct.

P. racemosa, *Roxb.*, F.B.I.—IV-222. Gardens. Oct.

P. malabarica, *Clarke*, F.B.I.—IV-223. Near Panchgani. Oct.

12. *Breweria.*

B. cordata, *Bl.*, F.B.I.—IV-223. Marmagoa. Vingorla. Nov.

B. latifolia, *Benth.*, F.B.I.—IV-223. Mulir, Sind. Verawal. Dec.

13. *Neuropeltis.*

N. racemosa, *Wall.*, F.B.I.—IV-225. Bankeri, Honaver, N. Kanara. Feb.

14. *Cressa.*

C. cretica, *Linn.*, F.B.I.—IV-225. *Kardi, Lona, Luna.* Konkan. Sind widely. Nov.-Feb.

15. *Cuscuta.*

C. reflexa, *Roxb*, F.B.I.—IV-225. *Akasvel. Amaryel* Hangal, Dharwar. Jan.-Feb.

C. hyalina, *Roth.*, F.B.I.—IV-226. *Ambar.* Sind.

C. chinensis, *Lamk.*, F.B.I.—IV-226. July.

CII.—SOLANACEÆ.

1. *Solanum.*

S. nigrum, *Linn.*, F.B.I.—IV-229. *Kangoni, Koawat.* Poona, Bombay. Hyderabad, Sind. Sept.-Dec.

S. verbascifolium, *Linn.*, F.B.I.—IV-230. *Kutri.* Poona. July-Oct.
S. pubescens, *Willd.*, F.B.I.—IV-230. Badami. Aug.-Nov.
S. bigeminatum, *Nees.*, F.B.I.—IV-231. Mahableshwar. Oct.
S. denticulatum, *Blume*, F.B.I.—IV-231. Mahableshwar.
S. giganteum, *Bl.*, F.B.I.—IV-233. Mahableshwar. Jan.-Mar.
S. ferox, *Linn.*, F.B.I.—IV-233. 40 miles west of Belgaum. In fruit Dec.
S. torvum, *Swartz.*, F.B.I.—IV-234. July.
S. indicum, *Linn.*, F.B.I.—IV-234. Khandalla. Mahableshwar. Sept.
S. melongena, *Linn.*, F.B.I.—IV-235. *Bengan.* Brinjal. Cultivated.
S. congulans, *Forsk.*, F.B.I.—IV-236. Near Karachi. Jan.-May.
S. xanthocarpum, *Sch. & Wen.*, F.B.I.—IV-236. {*Boringadi.* *Botingadi.* *Kandayri.*} Deccan. Sind. June.
S. trilobatum, *Linn.*, F.B.I.—IV-236 Badamii. Dharwar. Guzerat widely. Jan.
S. gracilipes, *Dene.*, F.B.I.—IV-237. Mulir, Karachi, Sind. Dec.-Jan.
S. tuberosum, *Linn.*, The Potato. *Batata.* Cultivated.

1.* *Lycopersicum* (America).

L. esculentum, *Miller*, F.B.I.—IV-237. *Wale wangee.* The Tomato. Cult.

2. *Physalis.*

P. minima, *Linn.*, F.B.I.—IV-238. *Chirputi.* Poona. Aug.
P. peruviana, *Linn.*, F.B.I.—IV-238. Cape Goosberry. Cultivated.

2.* *Capsicum.*

C. frutescens *Linn.*, F.B.I.—IV-239. *Mirchi.* Cultivated.
C. minima, *Roxb.*, F.B.I.—IV-239. *Lovungi mirchi.* Cultivated.
C. grossum, *Willd.*, F.B.I.—IV-239. *Bopala mirchi.* Cultivated.

3. *Withania.*

W. somnifera, *Dunal.* F.B.I.—IV-239. *Godha avada.* Karachi. Jooneer. Poona. Sept.
W. coagulans, *Dunal.*, F.B.I.—IV-240. *Punirband, Kaknaj.* Karachi. Dec.

4. *Lycium.*

L. barbarum, *Linn.*, F.B.I.—IV-240. Karachi. Porebandar. Nov.

7. *Datura.*

D. stramonium, *Linn.*, F.B.I.—IV-242. *Datura.* Deccan widely. June-Dec.
D. fastuosa, *Linn.*, F.B.I.—IV-242. *Kala datura.* Deccan. Guzerat. Sept.-Dec.
D. metel, *Linn.*, F.B.I.—IV-242. Poona. Sept.-Dec.
D. arborea, *Linn.*, sp. 256. Mahableshwar. Poona. Planted. Oct.-Dec.

10. *Hyoscyamus.*

H. muticus, *Linn.*, F.B.I.—IV-243. Khirtar Mts., Sind. Mar.

10. **Nicotiana.*

N. tabacum, *Linn.*, F.B.I.—IV-245. *Tumbaco.* Cult. Nov.-Feb.

CIII.—SCROPHULARINEÆ.

1. *Anticharis.*

A. glandulosa, *Aschers.*, F.B.I.—IV-249. Sind.
A. linearis, *Hochst.*, F.B.I.—IV-250. Sind.

3. *Celsia.*

C. coromandeliana, *Vahl.*, F.B.I.—IV-251. *Baboor kutaki.* Deccan. Guzerat. Jan.-May.

4. *Linaria.*

L. ramosissima, *Wall.*, F.B.I.—IV-251. Deccan widely. Sept.

5. *Schweinfurthia.*

S. sphærocarpa, *A. Braun.*, F.B.I.—IV-252. Karachi. Dec.

6. *Antirrhinum.*

A. majus, *Linn.*, sp. p., 859. Snapdragon. Gardens.

Russelia (*Mexico*).

R. floribunda, *Zuccar, DC.*, Prod.—X-332. Gardens.

R. rotundifolia, *Cav.*, *I. C. pl.*—V-9. Gardens.

10. *Sutera.*

S. glandulosa, *Roxb.*, F.B.I.—IV-258. *Bhul.* Karli. Poona. Feb.

11. *Mimulus.*

M. gracillis, *Br.*, F.B.I.—IV-259. Poona. Apl.

14. *Lindenbergia.*

L. urticæfolia, *Lehm.*, F.B.I.—IV-261. *Dhol.* Marmagoa. Baroda. Nov.

16. *Stemodia.*

S. viscosa, *Roxb.*, F.B.I.—IV-265. Veraval. Ankleshwar. Nov.-Dec.

S. serrata, *Benth.*, F.B.I.—IV-265. Penn. Callian. Dec.-Feb.

17. *Limnophila.*

L. Roxburgii, *G. Don.*, F.B.I.—IV-265. Tulkut Ghat. *Dalzell.* Sept. Kumta.

L. conferta, *Benth.*, F.B.I.—IV-266. Malwan. Dec.

L. polystachya, *Benth.*, F.B.I.—IV-26. N. Kanara. Jan.

L. heterophylla, *Benth.*, F.B.I.—IV-270. Mahableshwar. Oct.

L. racemosa, *Benth.*, F.B.I.—IV-271. Matheran. N. Kanara. Nov.-Jan.

L. gratioloides, *Br.*, F.B.I.—IV-271. Mahableshwar. Dakor. Penn. Nov.-Jan.

18. *Herpestes.*

H. Monniera, *H. B. & K.*, F.B.I.—IV-272. *Bama. Nirbrami.* Deccan. Sind. Oct.-Jan.

H. Hamiltoniana, *Benth.*, F.B.I.—IV-272. Malwan. *Dalzell.*

H. floribunda, *Br.*, F.B.I.—IV-273. S. Kanara. Feb.

20. *Dopatrium.*

D. junceum, *Ham.*, F.B.I.—IV-274. Narel. N. Kanara. July-Aug.

23. *Torenia.*

T. cordifolia, *Roxb.*, F.B.I.—IV-276. Londa. Oct.

T. asiatica, *Linn.*, F.B.I.—IV-277. Cultivated.

24. *Vandellia.*

V. crustacea, *Benth.*, F.B.I.—IV-279. Narel. Matheran. Aug.

V. hirsuta, *Benth.*, F.B.I.—IV-280. Kalyan. Sept.

25. *Ilysanthes.*

I. hyssopioides, *Benth.*, F.B.I.—IV-283. Guzerat. Mahableshwar. Nov.

I. parviflora, *Benth.*, F.B.I.—IV-283. Narel. Belgaum. Aug.

26. *Bonnaya.*

B. brachiata, *Link. & Otto,* F.B.I.—IV-284. Sawantwadi. Godra. Sept.-Nov.

B. veronicaefolia, *Spreng.,* F.B.I.—IV-285. "Common." *Dalzell.*

B. reptans, *Spreng.,* F.B.I.—IV-284. S. Konkan. *Dalzell.*

B. oppositifolia, *Spreng.,* F.B.I.—IV-286. Kalyan. Sept.

29. *Peplidium.*

P. humifusum, *Del.,* F.B.I.—IV-287. Bubak, Sind. Margoa. Dhurumter. Dec.

30. *Glossostigma.*

G. spathulatum, *Arn.,* F.B.I.—IV-288. Malwan. Nov.

34. *Scoparia.*

S. dulcis, *Linn.,* F.B.I.—IV-289. Salt swamp, Bombay. Nov.

35. *Campylanthus.*

C. ramosissimus, *Wight.,* F.B.I.—IV-290. Jungadi, Sind. Nov.

39. *Veronica.*

V. anagallis, *Linn.,* F.B.I.—IV-293. Deccan. Mar.

41. *Buchnera.*

B. hispida, *Linn.,* F.B.I.—IV-298. Koina Valley.

42. *Striga.*

S. orobanchoides, *Benth.,* F.B.I.—IV-299. Poona. Dakor. Matheran. Oct.

S. densiflora, *Benth.,* F.B.I.—IV-299. Poona. June-Nov.

S. lutea, *Lour.,*—F.B.I.—IV-299. Gadak. Badami. Nov.-Jan.

43. *Ramphicarpa.*

R. longiflora, *Benth.,* F.B.I.—IV-300. Wada, near Mahableshwar. Malwan. Nov.

44. *Centranthera.*

C. hispida, *Br.,* F.B.I.—IV-301. Wada, near Mahableshwar. Malwan. Oct.-Nov.

45. *Sopubia.*

S. delphinifolia, *G. Don.,* F.B.I.—IV-302. *Dudhali. Kulthi.* Guzerat. Deccan. Aug.-Oct.

S. trifida, *Ham.,* F.B.I.—IV-302. Panchgani. Oct.

CIV.—OROBANCHACEÆ.

1. *Æginetia.*

Æ. indica, *Roxb.,* F.B.I.—IV-320. Sewree, near Bombay. Oct.

2. *Christisonia.*

C. Lawii, *Wight.,* F.B.I.—IV-322. Purandhur. July.

3. *Cistanche.*

C. tubulosa, *Wight.,* F.B.I—IV-324. Karachi. Dec.

4. *Orobanche.*

O. indica, *Ham.,* F.B.I—IV-326. Diksal, Deccan. Oct.

CV.—LENTIBULARIEÆ.

U. stellaris, *L. f.,* F.B.I.—IV-328. *Utricularia.* Malwan. Nov.

U. flexuosa, *Vahl.,* F.B.I.—IV-329. Poona.

U. exoleta, *Br.,* F.B.I.—IV-329 Samasgi, N. Kanara. Feb.

U. albo-cœrulea, *Dalz.*, F.B.I.—IV-330. Mahableshwar. Sept.
U. cœrulea, *Linn.*, F.B.I—IV-331. Mahableshwar
U. reticulata, *Smith*, F.B.I.—IV-331. Mahad, S. Konkan. Oct.
U. orbiculata, *Wall.*, F.B.I.—IV-334. Khandalla. Lanauli. Sept.

CVI.—GESNERACEÆ.

1. *Æschynanthus.*

Æ. Perottetii, *A.D.C.*, F.B.I.—IV-339 Mahableshwar. Oct.

7. *Platystemma.*

P. violoides, *Wall.*, F.B.I.—IV-361. Champaneer, Guzerat. In fruit, Dec.

15. *Klugia.*

K. notoniana *A.D.C.*, F.B.I.—IV-366. Malkapur. W. Ghats. Oct.

16. *Rhynchoglossum.*

R. obliquum, *Bl.*, F.B.I.—IV-367. Dasgaon. Wadi. Oct.

CVII.—BIGNONIACEÆ.

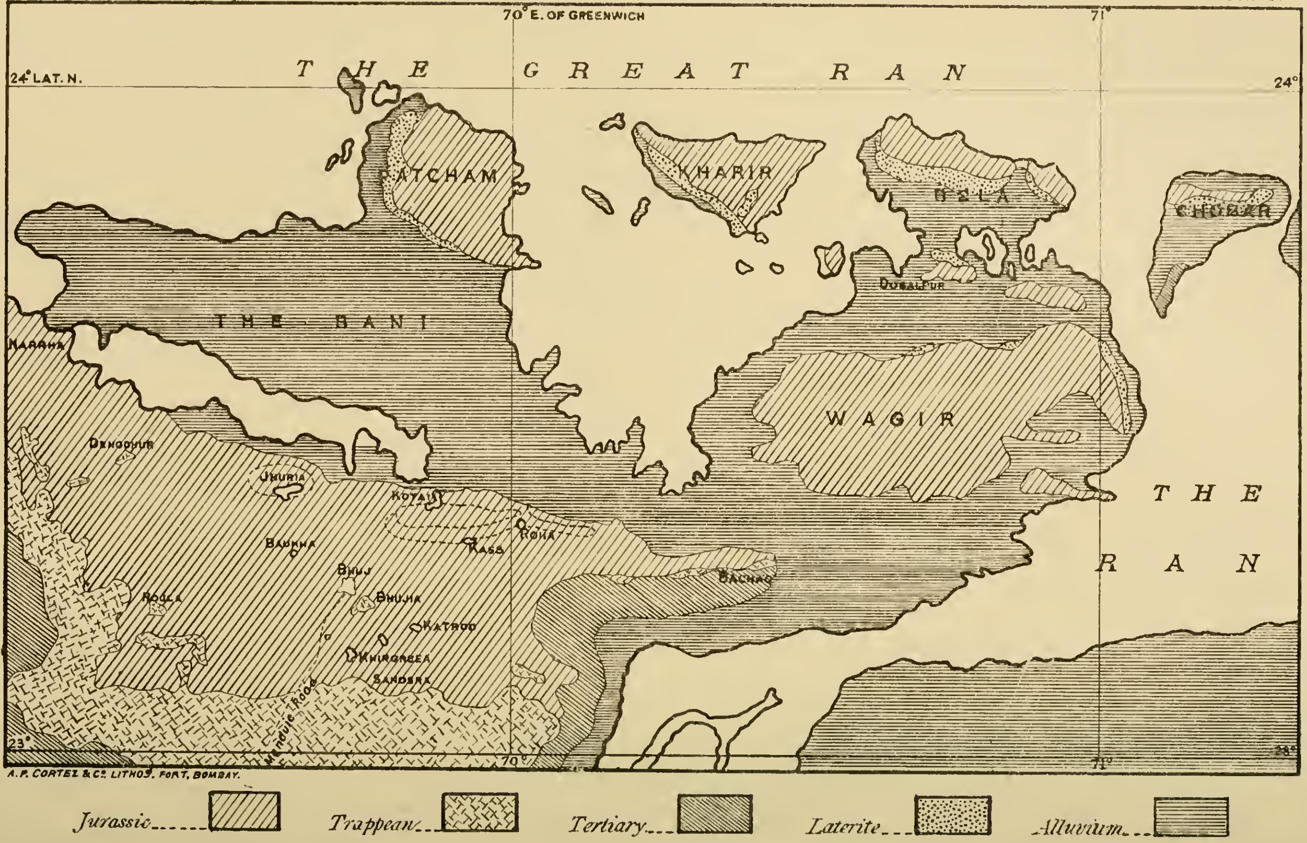
2. *Millingtonia.*

M. hortensis, *L. f.*, F.B.I.—IV-377. *Cowta nim.* Planted. Oct.

3. *Oroxylum.*

O. indicum, *Benth.*, F.B.I.—IV-378. *Tetu, Jagadala.* Peint Taluk. W. Ghats. June.

(*To be continued.*)


70° E. OF GREENWICH
71°
24° LAT. N.
24°
23°
70°
71°
23°
THE GREAT RAN
THE BANI
THE RAN
PATCHAM
KHARIR
BELA
CHORAR
DUSALPUR
WAGIR
NARRHA
DENODHUR
JHURIA
KOTAI
ROHA
RASS
BAUKHA
BHUJ
BHUJIA
KATROD
KHIRGREEA
SANDSRA
ROOLA
BACHAO
Mandvie Road
A. P. CORTEZ & Co. LITHOS. FORT, BOMBAY.
Jurassic
Trappean
Tertiary
Laterite
Alluvium

[For the Survey spelling of some of the names on this Map, see text.]

ON SOME SUPERFICIAL DEPOSITS IN CUTCH.

By the Rev. J. F. Blake, M.A., F.G.S.

[Abridged.[1]]

Part I.

(*With a Plate.*)

During a recent visit to Cutch for the purpose of studying the Jurassic [2] rocks there exposed, my attention was naturally attracted to a number of superficial deposits, which in some cases concealed, and in others were associated with, the solid rocks beneath. I cannot pretend to have made an exhaustive study of them, as I have only examined such parts as may be found in the Jurassic area; but these have suggested certain theories of their origin which I have not seen proposed elsewhere; and as these theories depend on observations which I do not find recorded, it may at least be hoped that an account of such observations may throw light on the origin of the deposits. The matters with which I propose to deal may be classed under the following heads:—

(1) Subrecent concrete.
(2) The boulder-beds associated with this concrete.
(3) Infratrappean grits.
(4) Laterite.
(5) Alluvium and Ran.

Of all these, except No. 2, there are to be found brief descriptions in Mr. A. B. Wynne's memoir on the geology of Cutch[3]; but, as a rule, that author does not venture on any suggestion as to their origin, and in no case does he appeal to the particular causes to which I have been led to refer them.

(1) THE SUBRECENT CONCRETE.

Under this name Mr. Wynne describes some remarkable deposits, of which he writes as follows:—"Very generally distributed over the hilly country is the subrecent calcareous deposit already alluded to. The white sandstones of which it consists are sometimes sufficiently coherent to be used for building, and it is very commonly burnt for lime all over the province. No fossils have ever been found in it, but on some slabs from the deposit in Western Cutch tracks of crustacea or of annelids have been observed. It is not limited to a uniform level in its various situations, having been met with in the low ground at the foot of the hills bordering the Runn as well as high in their glens. Its aspect is always very much the same, though its texture is varied, being sometimes conglomeratic or finely oolitic, and generally it presents some oblique lamination."[4]

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[1] [By the omission of that portion of the paper in which the quartzite-reefs and their mode of formation were discussed.]

[2] Throughout this memoir I use the word "Jurassic" for all the rocks so coloured on Mr. Wynne's map without prejudging the question as to how many of them may be, as some certainly are, of Neocomian age.

[3] Mem. Geol. Surv. India, vol. ix, pt. i (1872).

[4] *Ibid*, p. 81.

This description, which is the fullest in the memoir, does not in any way indicate the author's view of their origin. Indeed he elsewhere says, "The subrecent deposits, except in their most superficial portions, contain no evidence as to the conditions under which they were accumulated."[1]

Although in one sense it is true that they are very generally distributed, there are only ten definite localities where these deposits are sufficiently important to be noticed. Of these one is said to be of "quartz-gravel," and is thus, as will be seen, of a character different from the rest. There are also six other localities where I have noticed them, making in all fifteen to be considered, situated as follows:—1. The northern slopes of the Kala Dongar in Patcham.[2] 2. The summit of the Gora Dongar, north of Andhou. 3. In the glens at a considerable elevation in Bela. 4. On the northern flanks of the Habo Hills, near Kotae. 5. Below Roha Hill. 6. High up on the Kas scarp. 7. On the south side of the Jhurio Hills. 8. In the valleys of Varar Hill. 9. At Baukha, where it is quarried. 10. On Bhujia Hill. 11. At the base of Katrod Hill. 12. In the Katrod Hills between Ler and Jadura. 13. In a valley north-west of Godpur. 14. On the Mandvi road, where it is quarried. 15. At the base of the trap escarpment at Khedoi. It will be observed that the deposits are all very local, and usually associated with some hill. They appear also to be absent or inconspicuous on the western side of Cutch.

If we examine now more closely their mode of occurrence, some remarkable peculiarities become obvious, which should be some guide as to their origin. Thus the Kala Dongar Hills[3] have a steep escarpment on their northern side, and the slopes below have usually a direction parallel to it; but near the western end there is a projection of high ground forming a kind of bay which opens on the west, and it is in the angle of this bay that the subrecent concrete is found. In the Gora Dongar north of Andhou a broad open valley is formed by a dome of Jurassic rocks, the eastern side of which is bounded by an escarpment of limestone rising towards the north. Near the summit the continuity of this escarpment is broken, and we find a narrow recess of which the mouth faces west. It is on the two flanks of this recess that the concrete occurs, occupying nearly the highest level in the neighbourhood, which, from the figures given on the Trigonometrical Survey map must be some 560 feet above the level of the Ran. In the glens of Bela these deposits lie, as noted, at a high level. On the northern flanks of the Habo Hills the principal part lies on the southern slope of an outlying scarp and reaches a height of 300 feet above the Ran. In the three localities south of the same hills the occurrence is very instructive. Here a long east-and-west valley is bounded on the north side by gently sloping surfaces, and on the other or south side by a long and very uniform escarpment. This, however, is broken at one place where the pass over the summit crosses, and shows a kind of notch in the outline which is the only spot where the subrecent concrete occurs. It here reaches its highest elevation, being not more than 100 feet below the summit of the escarpment, and therefore about 700 feet above the level of the Ran. Towards the east the valley closes in, and we reach the watershed below some high hills. It is on the west side of this watershed that the greater part of these deposits of concrete occurs, while there is very little on the east. (See fig. 10 in Mr. Wynne's memoir). On the south side of the Jhurio Hills there is a fairly continuous encircling scarp which faces north. The main drainage of the southern slopes of the inner hills escapes through a gorge in this scarp, which at one time was fairly broad, but is now nearly choked up by the concrete, while within the scarp we find the concrete spreading out as a thick white mantle over a square mile of the slopes beyond. Notwithstanding this, the outer slopes of the scarp, up to within a few hundred yards of the gorge, are quite bare, the solid rocks being everywhere visible. At Bhujia Hill the deposit is found in a semicircular valley which opens on the south. Between Ler and Jadura there is a long east-and-west valley opening to the east, and this is almost entirely bare ; but at one place a basaltic dyke crosses the valley like a wall, and on the west side of it the concrete is piled up in places to its summit. A similar phenomenon may be seen in the valley north-west of Godpur. Where the Mandvi road crosses the Charwar range, it traverses in one place a valley whose streams run west, and in this valley we find the concrete on the north side resting against the Jurassic prominences as seen near the Mandvi road. Farther east the locality Khedoi, where Mr. Wynne records this concrete, is situated in a semicircle eroded back from the general line of the trap-escarpment.

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[1] Mem. Geol. Surv. India, vol. ix., pt. i. (1872), p. 85.

[2] The spelling of the names is in all cases that found on the Trigonometrical Survey maps, but the local pronunciation, as given by Mr. Wynne's names, is often very different, unaccented *a* being pronounced as a short *u*, and *d*, *l* and *r* being often interchangeable.

[3] The Kala Dongar Hills run along the northern half of Patcham, and the Gora Dongar Hills along the southern half.

In structure these deposits are very uniform. Leaving out of consideration for the present the large stones derived from the nearest solid rocks, which they sometimes contain, they consist of fine particles very slightly agglutinated, so that a blow of the hammer shatters them to dust. Some southern varieties however are tougher, and are used for building, while on reaching the extreme north-east in Bela we find them scarcely consolidated at all. They are for the most part obliquely laminated, and in this case the slope of the laminæ in the part of the deposit nearest to the solid rock is in the direction of that rock.

In composition the majority are mostly white sand, cemented only with calcareous matter. In the more southerly exposures there are calcareous particles also, but I have not seen any that are truly oolitic. The complete rounding of the particles gives the rock that appearance, especially in the deposit near Kotae; but on examination they appear to be organic fragments, and there are white specks which consist of little-worn miliolines. These organisms belong, of course, to the deposit itself ; but the concrete is in the habit of enclosing what it finds on the spot. Thus at Bhujia Hill it is full of the fragments of trap that have fallen from the summit; on the Kas scarp it encloses the little *Buliminus* which is now living in the district; and in Bela it is said to enclose human bones, though it is not stated definitely that the deposit there was undisturbed.

Such are the facts with which we have to deal in attempting to discover the origin of these curious deposits. Their constant association with hills, and their occurrence in the glens, might suggest at first that they are a rain-wash, more or less transported by rapidly descending water, on account of their lamination. But this seems impossible. In some cases no doubt the solid rocks might yield the sand, but it would be ferruginous, not white, and such sandstone-rocks would yield very little calcareous matter. But in other cases there is no sand in the neighbourhood at all. Thus in the Gora Dongar all the hills are of limestone, and the deposits are at the very summit. The same may be said of the deposit in the Jhurio Hills and in Bela, while the miliolines at Kotae cannot possibly be of local derivation. Moreover, the deposits lie on a great variety of rocks, and yet have an uniform character. We may therefore dismiss this explanation.

Another alternative is that they are marine deposits. This would involve a depression, in quite recent times, of 700 feet or more, and would in no way account for their peculiar local distribution nor for their lamination. One might also expect marine shells when delicate *Bulimini* and tiny miliolines have been preserved. But greater than all other difficulties is that of their loose porous character. So far as my experience goes, no deposits that have been laid down in water are of similar character. The water invariably aids the particles in packing together at their closest, and with such materials as these they would form a solid rock.

There remains, so far as I can see, but one other alternative, and that is that they are æolian in origin, and this will, I think, be found to account for all their peculiarities. It would need, however, a strong wind to raise sand up to 700 feet in one place and 560 feet in another, and carry the miliolines from the nearest sea. We must therefore enquire whether there are such winds in Cutch.

The Meteorological Office in Simla publishes every day a series of observations showing, amongst other things, the average rate per hour for the last 24 hours and the direction of the wind at 8 A.M. We cannot gather from

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Mr. Wynne (*op. cit.* p. 103) speaks of a small patch of littoral concrete full of shell-casts on the northern side of Patcham, about 20 feet above the Ran ; but he does not classify this with the "subrecent" concrete, which he says is unfosiliferous this what was the direction of the wind at other times, for, if the direction has changed, the time of the change is not recorded; but, by assuming that the direction at 8 a.m. is the same as that for 12 hours before and 12 hours after, we may arrive at a rough estimate of average direction and speed. Taking the year 1895, and treating the records in this way, it appears that the air travels at Bhuj, in the various directions, at an average rate of 10½ miles per hour for the whole year. But at the end of this time the air is not found to have returned upon itself. According to the records, a particle of air which travelled constantly with the wind would find itself at the end of the year 66,000 miles to the east and 9,600 miles to the north of its initial position. These figures of course are merely indicative of general results, the meaning being that there is, on the whole, a constant passage of air in one direction, from a little to the south of west, at a rate of 7⅔ miles per hour.

We shall form, however, a better idea of the action and power of the wind by examining the records in detail. There were, in the first place, only 40 occasions in the year when there was any east in the wind at all, and the total velocity of such winds was only 12½ per cent. of that of the westerly winds. Again, for the greater part of the year the winds are not excessive, but, out of the 140 days between April 25th and September 11th, no less than 90 days' gales are recorded, seven of which are specially recorded as dust-storms. If now we confine ourselves to these dates of gale, we find that the average velocity was 20 miles per hour, and the average direction about 20° south of west. The velocity exceeded in six cases 30 miles per hour. This is an average for 24 hours, and as gales do not continue to have a constant velocity for so long, there must have been not infrequent times when the wind was moving at 40 miles per hour. The complete records for other years I have not been able to consult; but there is no reason to believe that 1895 had a maximum of wind, nor are we sure that the present winds as a whole are equal in intensity to those of some period of the past. We have, therefore, good reason to believe that there is adequate force available to do the work required.

Moreover, similar work is now being done, as witness the dust-storms for which Cutch is famous. As, however, the gales blow from the west, it is important to know what happens in that direction, and on consulting the meteorological reports above quoted, we find that there were no fewer than 55 dust-storms recorded at Karachi during 1895, mostly under westerly winds, and in the other stations next north and north-east of Cutch 53 dust-storms and 53 dust-hazes, which latter may be taken to mean the transport of the finer particles of dust. It is obvious, therefore, that the passage of fine sand, etc., across the country is a widespread phenomenon.

We have evidence also that the sand thus carried travels with great velocity, for, as shown on p. 456 of the 2nd edition (1893) of Blanford and

Medlicott's "Geology of India," there are in Sind two types of sand hills—one lying transverse to the prevailing winds and the other parallel to them, the direction here being about 30° south of west. Now it is only necessary to study the drifting of snow to see that, while comparatively gentle winds make transverse drift, the snow that is borne along tumultuously by the wind lies, when the wind drops, in long straggling lines parallel to the course it has taken. These longitudinal sand-dunes therefore indicate a great velocity of wind in the desert north of the Ran, so that we are not surprised to learn that some of them, even without the aid of any inclined plane of solid rock below are able to attain a height of 400 to 500 feet. That the same phenomena are found in Cutch itself may be gathered from the fact that, in speaking of the sand-dunes along the southern coast, Mr. Wynne says that they have a bearing of about 20° south of west, [1]which is exactly the average direction, as seen above, of the strongest winds. From personal observation I can only say that at Mandvi, after the close of the monsoon season, when the sea had calmed down enough for steamers to call, the wind was constantly blinding with sand, and the pier was all buried in a dune. That large areas of Cutch are now covered with still drifting sand is pointed out by Mr. Wynne.[2]

The cause assigned being thus found adequate for the work, we must next enquire how far it explains the special phenomena noted above. As it was the distribution of the deposits that suggested the cause, this must be taken first. Now all the localities may be described as spots where a wind coming from the west or south would be stopped by an obstacle, or where a shelter-spot exists in a long scarp. Thus in the Kala Dongar the wind would be stopped by a projecting high land, below Roha Hill by a watershed, below Bhujia Hill by the hill itself, between Ler and Jadura, and also North-Western of Godpur, by projecting dykes, and on the Mandvi road by the Jurassic escarpments. On the other hand shelter-spots occur above Andhou on the Gora Dongar, on the flanks of Habo Hills on the Kas scarp, on the south side of the Jhurio Hills, and at Khedoi on the trap-escarpment. In some other places, as along the north side of the Katrod Hills, and apparently at Baukha, the deposit makes no feature on the surface, being level with the ground, and thus probably fills originally existing hollows. To this latter category must also be assigned the various glens in which the deposits less abundantly occur.

It is thus seen that the horizontal distribution is exactly what it ought to be. In the vertical direction, where the deposits occur at high levels inland, the main valleys are also high, so that there is not a great difference of level; but in the case of the Gora Dongar, where the deposits are 500 feet above the neighbouring Ran, there is a gradual rocky slope all the way, leading up to the hollow where they lie. In the case of the Kas scarp the west wind would be hemmed in by lofty hills into a gradually narrowing valley, so that its force would be greatly increased.

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[1] Mem. Geol. Surv. India, vol., ix. pt. i. (1872), p. 82.

[2] *Ibid*, p. 12.

The lamination may, at first sight, seem a difficulty in the way of the proposed explanation, but it is not so. The principal dust-bearing gales are in the hot season, and these will leave a deposit of sand or calcareous dust upon any pre-existing surface. Then the succeeding rains, which are not often so heavy in Cutch as to wash such deposits away, will cement the particles together at once as they do the flood-deposits along the river-sides. Thus each lamina will represent a season's work. That the laminæ should dip towards the rock on which the concrete rests, on the side nearest to the rock, is what we should expect in a wind-blown deposit. For when sand is blown against an obstacle it is thrown back again, and the wind has to pass away on either side, so that in such places we always find an intervening valley between the mound and the obstacle, the surface of the mound thus sloping towards the obstacle.

The loose porous character of the deposits, as already pointed out, is against their aqueous origin, but is what we should expect in an æolian formation only so far subjected to water that it has been rained upon. The uniformity of general character over a wide area, independently of the rock below, is thus fully accounted for. The more calcareous composition of the southern deposits is due to the fact that the materials here are mostly derived from the sea (hence the miliolines, also), while farther north the dust is reinforced by the breaking-up of the Jurassic sandstones. The enclosure of the local rocks and of the local *Buliminus* is quite natural, the dust finding its way into the interstices of whatever was lying on the ground.

(*To be continued.*)

[From the *Journal of the Geological Society.*]

REVIEW.*

By W. F. Sinclair (late i.c.s.).

This volume concludes the series on Indian Vertebrate animals, begun ten years ago with a half volume on Mammalia, whereof some of us are already wishing for a new edition or reprint, with a good full appendix. It deals with "all the game birds, both of land and water," using the word "game" in the widest sense ; and if we had had it on our mess and club tables (to say nothing of private houses and public institutions) ten years ago, Mr. Oates' new volume on the same groups would be coming in handy now as a sort of second edition or successor, instead of being a very serious competitor in the market. Mr. Blanford however has necessarily much to say about birds never classed as "game" in English, especially the Seafowls and Herons, and may be considered as stepping into the place long and honourably occupied by the third volume of Jerdon's "Birds of India." This must now go "on the shelf" with the "good-bye" due to a retiring veteran "full of years and honours."

Like that volume, the present begins with the pigeons and doves, taken as an order by themselves, of which all the Indian genera are put into one family, *Columbidœ*, with six subfamilies of admittedly doubtful value. The first are the green pigeons, *Crocopus chlorogaster* and *C. phœnicopterus*, of which the former is our Bombay Hariál or Pisawa. The Burmese *C. viridifrons* is treated as only the most marked form of the latter. The years since Jerdon wrote do not seem to have furnished any confirmation of his observation that these birds come to rivers to drink ; and the practice must be very uncommon, occurring perhaps only when they happen to be on a less juicy diet than usual, or on some rare occasion of place or climate.

In the next genus, *Osmotreron*, we seem to have only one bird, the grey fronted green pigeon, *O. affinis*. This has been hitherto generally called *O. malabarica* ; but both the specific names are Jerdon's, and the former the oldest. It is not very well known to Bombay sportsmen, and the native shikaris scarcely distinguish it from the

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* "*The Fauna of British India, including Ceylon and Burma.*" Published under the authority of the Secretary of State for India in Council. Edited by W. T. Blanford, F.R.S., "Birds," Vol. IV, 1898.

"Pisawa." But it is smaller, and has red legs instead of yellow, easily distinguished by a field-glass ; and these are distinctions that the better of them can make out, when a description of shades of plumage is useless. Mr. Blanford gives the habitat as "forests of the Malabar Coast from the neighbourhood of Bombay to Cape Comorin." What brings Bombay into the Malabar Coast is not clear. But I have a note of one shot in my presence in the police lines of Alibag on the 20th July, 1890 ; out of a flock. Jerdon's other localities are shown in a note to be doubtful, and seem not to have been confirmed by any other observer. I suspect the species to occur along the Western Ghats, right up to the Kondai Bari, where I saw something like this bird myself, and heard of the like from others. But no specimens were secured in my time (1873).

There seems to be doubt about the representation in our province of the Imperial Pigeons or *Carpophaginæ*. The records of *Carpophaga aënea*, the green imperial pigeon, do not carry it north of Kanara with any certainty. There is some large wood-pigeon in the Tanna and Kolaba forests, with a very loud call. The late Mr. George Gibson reported it to me from Tungar ; and I have heard it in many places, and once had a good chance of watching a pair on the forest plateau of Landur, near Rohe, Kolaba District, 19th February, 1888. The natives called them *Ghúrti*. As they were evidently shy, and I wanted to make sure of the call, I took the field-glass to them instead of sacrificing the observation to a chance of a shot. The call was almost a hoot. I took them for *Alsocomus*, Jerdon's *elphinstonii*, the wood-pigeon or imperial pigeon of the Nilgiris. Mr. Blanford puts it in the sub-family *Columbinæ*; but its habits are admittedly much the same as those of the last bird ; and I suspect some confusion between them in the forest, where the colours are not always easy to observe, and the observer is often hampered by public duty, or by the chase of larger game. If the *Ghúrti* turns out to be *A. elphinstonii*, Mr. Blanford's northern limit of Mahableshwar will be stretched by a couple of degrees of latitude ; and it seems to be rather the business of our Society to get at the truth about such very handsome neighbours. *Ducula cuprea* may occur in the Tanna and Kolaba forests. It is an unlucky thing that all three birds have red legs, so that the difficulty of identifying perching specimens with the field-glass is very great. You do not often get a good view of the beak with glasses, except in the case of such large birds as the herons. If you can see the bird he can see you, and probably looks straight at you.

The probable confusion of the "Nilgiri Imperial Pigeon" with the two true "Imperial Pigeons" mentioned has brought him into notice somewhat before his turn and in advance of the "very ill-defined" sub-family of *Phabinæ.* Of these we have the "Bronze-winged" or Emerald Dove, which in Mr. Blanford's phrase occurs in "forests near the Malabar Coast to the neighbourhood of Bombay." I should not be surprised to hear of it almost to the Tapti. It is certainly confused by natives of the cultivated lands, and by some Europeans, with *Osmotreron affinis.* Both have red legs, and they are to be seen in each other's neighbourhood. But the Bronze-wing, as might be expected, is of a rather dark metallic-green, a rather solitary bird in its ways; and a frequenter of the ground and of rather low vegetation, especially bamboo jungles and even gardens. The other bird's tints are soft and leafy. It is seldom seen alone, seldom, if ever, on the ground or on small trees or bamboos, and it whistles, while the Bronze-wing coos. Neither is often shot—and so much the better—so these hints may come in useful for identifying the living wild birds.

We have two "Blue Rocks"—

(*a*) the European *C. livia* in Sind, only distinguished by having rather a white "back-band" than a white "coat-tail" as in Europe;

(*b*) the Indian Blue Rock, whose coat-tails are grey; all over the Province and Peninsula.

A small stock-dove, *C. eversmanni,* visits Sind in winter. Our turtle-doves are so familiar as hardly to require notice here.

If any reader has seen any of the pigeons or doves eating winged white-ants or locusts, a note would be of interest. At present there seems to be little evidence of their using any animal-food at all; but few birds can withstand those temptations.

(*To be continued.*)

INDIAN WILD CATTLE: THE TSINE AND THE GAUR (MISCALLED BISON).

Very little is known of the Tsine (*Bos sondaicus*), and any detailed account of it must be interesting to all zoologists. The account given by naturalists of the Indian wild cattle is very meagre, for very few of them have been personally acquainted with these beasts in their wild state. I have no pretensions to be considered a scientific naturalist, for I know nothing of anatomy, and very little on the subject of species, genera, &c. But I have observed to the best of my opportunities, and having been a fairly successful sportsman, I trust I may be excused for offering the following observations. Tsine are certainly kittle cattle. During thirteen years' wanderings in Burma I only succeeded in killing three bulls and two cows, and four of them only just before I left India. I agree with Dr. Wood's description and remarks, with the exception that I never saw the warts he mentions, and that those killed by me had the whitish rings round the eyes. Can there be two varieties? Mine were shot at the foot of the Yomas on the Sittang side. The bulls also were of a deep red, but I have seen them in the distance almost as dark as a middle-aged gaur (*Bos gaurus*), that is coffee-coloured, but never could get at them; nor did I notice the "thickened portion of skin devoid of hair and of a greyish-black colour, the general surface smooth, but in patches very warty, like the skin of a rhinoceros." Could this have been caused by the animal rubbing his forehead to get rid of parasites, as all sambur have in May a bare spot about the size of a shilling on the neck, caused, the Burmese said, by their rubbing it on fallen trunks to rid themselves of parasitic pests. There is a dorsal ridge of course as in the other wild cattle, but not nearly so pronounced as in the gaur or gayal and not more than in the wild buffalo. Mr. Carter, a well-known naturalist and sportsman ("Smoothbore" of *The Field*) wrote as follows:—

"Colonel Pollok when referring to the tsine says that it has a slight dewlap, which is not always apparent"; whilst Jerdon, writing of the same animal says "it resembles the gaur more than the gayal, and it wants the dewlap."

I do not think Jerdon had ever seen a tsine. I can see no resemblance between a tsine and a gaur, but a very great one, especially at a distance between the gaur and the gayal. I am glad to see that the doctor says the bull he shot had a slight dewlap, about three inches in its greatest breadth. But whilst his bulls were wanting in the white patches on the buttocks, mine had them very distinctly. The bulls are certainly savage, and attack most pluckily after being wounded, at least mine did. The first and only one I shot for years was in company with Captain Hill (now Governor of H.M.'s Jail, Manchester), and he came at us with a will, but had no chance, as Hill used a breech-loading rifle of mine, and I had two heavy two-grooved No. 10 bore rifles by Joseph Lang.

The Gaur (*Bos gaurus*).

This wild bull is found not only in Southern India and the Trans-Gangetic provinces, but it has been shot at the foot of the Himalaya mountains, usually called the Terai. I have seen splendid heads brought down from the Mishmee hills. There are thirteen pairs of ribs. The chest is broad, the shoulder deep and muscular, and the forelegs short with the joints very short and strong, the arm exceedingly large and muscular. The skin on the neck, shoulders and thighs is very thick—about two inches—and is very valuable for the soles of shooting-boots.

Many old bulls have so little hair that they appear as if they had been shaved. When the bull arrives at maturity, which is at about six or seven years, rings begin to form at the base of the horns; and, it is said, one is added each year; if so, I must have shot bulls thirty-five or forty years of age. They prefer hilly ranges with flat table-land at top, at an altitude of about 2,500ft.; but they have been killed up to 5,000 ft. and traced up even higher. They are wonderfully active animals for their size and bulk. They browse on young bamboo shoots, and are also fond of grazing on the young grass which springs up after the annual fires. They retire during the heat of the day either to forests, or force their way into heavy patches of long elephant-grass, and lie there to escape the gadflies, which otherwise torment them dreadfully. As a rule they are inoffensive, but a solitary bull has been known to charge without provocation; if closely followed, all gaur are apt to prove pugnacious. They are not difficult to kill; a bullet well placed behind the shoulder, in the middle of the shoulder, or behind the ear, or a raking shot forward, will account for one. I have known one paralyzed by a shot through the dorsal ridge. When alarmed, their enormous strength and weight enable them to crash through tree and bamboo jungle as if they were but reeds. I have known them when alarmed to snort and stamp with their feet before retiring. The tongue and marrow-bones are unexceptionable; the only portion of the beast fit to eat by Europeans is the middle layer on either side of the dorsal side, just below the hump; the tail makes very good ox-tail soup.

Mr. Sanderson shot a gaur in Assam and as its name and that of the gayal is "Mithun," he came to the conclusion that there were no wild gayal; but although "Mithun" is usually applied to both the gaur and gayal, yet, if pressed, the people will own to an "Asseel Mithun," or true gaur, and a "Mithun", or bastard gaur, the gayal. In a natural history lately published,* it has been asserted that the gaur has been tamed, and that they are kept in captivity by natives on our North-Eastern Frontier; but this is altogether erroneous. The very old bulls are either driven away from the herds, or retire and become solitaires, and are the best worth shooting; but they are wary and difficult to get at. Other conditions being favourable, wherever there are salt-licks, that is, depressions where a whitish clay impregnated with natron is found, these wild cattle, deer, and even the *felidæ* will abound. It is the gayal that are in captivity, and not the gaur. When I first went to Burma I wrote to Mr. Blyth, the Curator of the museum in Calcutta, that the Burmese gaur appeared to me to be larger, and to differ somewhat from the Indian; but he wrote back I must be mistaken, as the gayal took its place in that country, the true gaur being absent. However, I was soon able to correct him by sending him heads, and as he shortly after visited the province he convinced himself that I was right, and wrote that, not only were there the true gaur in the country, but that the skulls and horns were superior to those from Southern India. I pointed out to "Smoothbore," many years ago, that there were two distinct varieties of this wild bull; but he was incredulous until he visited Calcutta and spoke to Dr. Anderson, who said, "Pollok is quite right; here are skulls of both." The discrepancies may be due to climatic influences and abundance of food; undoubtedly the gaur of Burma and of our North-Eastern Frontier are larger than the Indian. I have shot a bull within an ace of 21 hands at the shoulder, and General Blake, an old sportsman, shot a cow 19 hands, whereas the largest bull killed by him in India was of the same size, and the largest he ever saw killed in the Wynaad but two inches higher. Even in India gaur vary, those of the Western Ghats being larger, and with a profile like a ram, in that respect resembling their Burmese brethren. Not only does the Burmese gaur stand higher, but the dorsal ridge extends further back to within a span of the croup, the dent in the forehead is deeper, the cylindric crest higher, the horns larger, heavier and more truncated, and but seldom worn at the tips as in the Indian. I fancy food is so plentiful they have no need to grub up roots. The heads of the females are, if anything, longer than those of the males, and the nose is more arched.

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* "The Royal Natural History" was evidently misled by Mr. Sanderson. Although a gayal at a distance looks very like a gaur, the heads are totally dissimilar; the gaur's has a semi-cylindrical crest and a concave forehead; the gayal possesses neither.

Those in the Northern Circars of the Madras Presidency, where I shot a great many, have, comparatively speaking, shorter heads and less of the ram look, the dorsal ridge terminating about the middle of the back. Then, too, there is the dewlap. Has the gaur one or not? Up to a few years ago the opinion was—not. But the question cropped up about two years ago. Mr. Bartlett, the late Superintendent of the "Zoo," wrote that the one that lived in the gardens had a well-developed one. Elliot, Jerdon, Campbell, Sterndale, all said he had none, and I too was of that opinion; but "Smoothbore" writes: "A planter of many years' experience in Travancore, and a keen observant sportsman, states that in some examples the gaur have scarcely any dewlap and that in others it is strongly developed. So marked is this difference that the natives divide them into two castes, calling one 'Katu Madoo,' or Jungle Cow, and the other 'Katerimy,' or Jungle Buffalo. He has shot old bulls with at least six inches of skin hanging clear of the chest and throat. This seems extraordinary when naturalists have mostly described the gaur as having little or no dewlap. Dewlap originally meant the loose fold descending from the chest, which, when the animal was grazing, swept the dew: thus, in 'Midsummer Night's Dream,' hounds are described as 'dew-lapped, like Thessalian bulls'; but in the humped Indian cattle the fold extends from the throat downwards, and in the Mysore draught bullocks and in the Brahmini bulls is enormous, whilst in the ordinary village cattle the development is small."

The following notes on the gaur will be interesting to most readers. Mr. A. F. Martin, of Travancore, writes :—

" When the Kannan Devan hills in North Travancore were opened out for tea and cinchona some years ago, the felling of the tea forest restricted the wild beasts, particularly the elephants and bison, when passing across the estate, to one or two pathways. One particular track was however left to them for about ten years, when further cultivation led at last to the blocking up of even this right of way. The animals were at first much puzzled, and both elephants and gaur took to wandering about the cultivation. The elephants accommodated themselves to the altered conditions and used the estate paths. The gaur, more suspicious, took a straight line for their grazing-grounds over the rotten felled timber and through the older cinchona plantations, but were often brought up by the sight of whitewashed walls surmounted by a corrugated iron roof.

" At last they settled down to a pathway between the old cinchona and natural belt left between it and the new clearing.

" A pit 10 ft. long, 8 ft. wide and 8 ft. deep was dug on the boundary, covered with a mat made of reeds and bamboos, over which earth and dry leaves were scattered. The smell of the fresh earth however turned them off. Once a gaur got his fore feet down the side of the pit, but made a bold jump and cleared it.

" After some months the tracks of a large herd were found making for the pit, and it turned out that a gaur had fallen in but managed to jump clean out again. It was evident that 8 ft. was not deep enough, and rock in the bottom prevented its being sunk deeper. Another pit was therefore dug some distance away on the same boundary. The ground was on the side of a steep hill, so that whilst the lower wall was 10 ft. the upper was 14 ft. deep.

" After a while a cow-gaur fell in, but whilst Mr. Martin was watching her and waiting for coolies to help in putting logs across the pit she managed to scramble out, and although she followed the path to the old pit, she avoided it and escaped. Two days afterwards a bull fell in and was secured. Mr. Martin describes the trouble they had with this huge animal. Getting logs across the top of the pit, with the gaur charging madly about, was exciting work, and the feat was successfully accomplished only after the utmost difficulty and danger.

"The appearance of any one near the pit always caused a furious demonstration on the part of the gaur, who dug big caves in the side of the pit with his horns, and thus an approach to the edge was rendered dangerous. In ten days' time he had become somewhat tame. He tossed about the grass thrown in to him, and trampled it into the mud, eating but a small quantity. His only drink was water poured into the pit, and which collected in the holes he had made in the mud with his feet. Matters were very little improved by having bundles of grass lowered by a long piece of cane fastened round, for he charged them furiously, and got a lot of the grass on the ground only to trample it into the mud.

"By degrees he began to eat more and to throw less about. Water was a great difficulty ; any attempt, too, at lowering a bucket to him was futile, and only ended in the bucket being flattened out.

"It became imperative therefore to get him out of the pit. To attain this end a stockade, about 30 feet square, was made round the pit consisting of stout poles, 15 feet high at the lower, and 10 feet high on the higher part of the ground. They were each sunk about 3 feet in the ground, 18 inches apart, and lashed together with cross-sticks and fibre, and formed an almost solid wall. A sheet-iron trough was fixed in one corner. When complete, large quantities of brushwood, ferns, and grass were thrown into the pit, until by degrees it became half full and the gaur was enabled to jump out. His first act was to charge the corner whence he was being watched, but the only harm done was to himself, his frontal ridge being slightly cut. His attention was then attracted by the water-trough which he knocked about considerably, but finding the water he took one good long drink before finally knocking it to pieces. During his examination of his new quarters he once more fell into the pit, and this enabled us to repair damages ; but before they were quite completed he jumped out again and caused a general stampede. Having twice hurt his head against the stockade he never again made any attempt to test its strength. The sheet-iron trough seemed to annoy him more than anything else, and was soon rendered useless. A three-cornered wooden trough was then inserted in a corner and protected by stout poles across the corner of the stockade, and this having been satisfactorily arranged the gaur soon became comparatively tame. He allowed the measurements of his horns to be accurately taken, through a window left in the stockade, and very fine horns they were too, measuring 34½ inches across from outside to outside of sweep. Although the pit was filled up level with the ground, his previous experience led him to conclude that it was dangerous and he never crossed it. The result was that the narrow space between the pit and the stockade became ploughed up, and he was up to his hocks in mud. It therefore became necessary to enlarge the enclosure for about 100 yards in length, taking a bit of jungle in for shelter and a small ravine which would hold water. A small shed was erected with sliding bars on the outside and inside with a view of introducing a domestic cow as a companion, so that, if he approved of her, she might be let into the stockade.

"He took to his new quarters very kindly, and soon got to know that grass was left for him at the inner gate of the shed. In a short time it was found that he liked having his nose and head rubbed, and licked the clothes of the person who rubbed him. He took salt from the hand, but did not at first seem to care about it, probably because it was not mixed with earth as in salt licks which he was accustomed to, spitting it out if he got too much in his mouth at one time. After two months he became quite tame, and permitted his captor to come into the enclosure, not even moving if he happened to be lying down. After the third month he began to shed his hair, and liked it rubbed off with a wisp of grass, allowing the operator to sit on him whilst cleaning him ; but he did not like his hind legs or tail to be touched, kicking out as if he were tickled when this was done.

"After four months a domestic cow was put into the shed, and the two ate from the same bundle of grass, one on the outside and the other from the inside of the shed. When the cow was let into the stockade, neither of the animals took any notice of the other, so the cow was taken out. Although so tame with a European, the gaur would never allow a native to come near him ; and it was unsafe to be in the enclosure if a native came anywhere near, as the bull would jump up, snort, and rush about the place in a very excited manner. The cost of bringing grass for him (of which he ate 2 cwt. per diem) was so considerable that it was thought advisable to put a ring through his nose and have him led out to graze with the domestic cattle. A rope was tied round his horns, and his head securely fastened between two bars of the stockade ; it would then have been easy to ring his nose from the outside, and it is a thousand pities that this was not done. His terror was however so great that the attempt was given up for that day, and it was settled to postpone the operation until he had become accustomed to have his head tied up. Alas ! as will be seen, the glorious golden opportunity was lost in this wise :—

"It will be remembered that there was a shed in one corner of the stockade built with a view of introducing a domestic cow to bear the gaur company. In this shed was kept guinea-grass to be given to him in the mornings. One night however he thought he would prefer having this grass, of which he was inordinately fond, without waiting for daybreak. He managed to push aside one of the sliding bars of the gate, break a lower one down, and raise the top bar sufficiently for himself to get through. He ate the bundle of guinea-grass, and when this was finished he repeated the performance with the outer bars of the shed and walked out to freedom. We are all wise after the event; but it was great carelessness in not pinning the bars as is done in all well-managed stables in India. If this plan had been adopted, this magnificent animal, 18 hands 1½ in fair vertical height, might by this time be enriching the 'Zoo,' where nothing but a miserable two-year old calf has ever been exhibited."

From one cause or other, no two observers agree as to the colour of a gaur, Mr. Martin's notes on this adult bull are therefore interesting and instructive :—

"Slatey grey on the dorsal ridge, deepening to intense on the sides and shoulders ; coffee-brown on the hind quarters, turning to black on the flanks; hoofs white ; legs white to two inches above the knees and hocks on the outside, and to one inch above the knee and hocks on the inside ; hair inside the thighs and armpits bright chestnut ; neck black with a large dewlap, covered with coarse black hair hanging down to a little below the level of the knees ; head, frontal ridge, slatey grey, black down the front and sides of the face ; the muzzle bare and dark slate. Colour of the iris of the eye mottled light brown ; pupil slatey blue. But these differ in colour in accordance with age, the very old being black, with the exception of the stockings and forehead, which are dirty white."

In another instance a large bull gaur was caught in an elephant-pit on the Annemallie Hills, and this animal took water freely from a bamboo spout. The gentleman who caught it, not being in a position to keep and tame the bull, released it ; but it was ungrateful and resented its capture by charging down on its captor whilst the latter was taking its photograph as it emerged from the pit, and he had to fly ignominiously ; but not before he succeeded in photographing the animal.

Whether the gaur would interbreed with tame cows like the gayal remains to be proved ; but I see no reason why it should not. I believe that there are hybrids on the continent between the Java variety of tsine and tame cattle ; but I do not think a tsine has ever been on show in our Zoological Gardens.

MEASUREMENTS OF AN INDIAN BULL AND A BURMESE BULL AND COW GAUR.

	INDIAN	BURMESE.	
	1 Bull.	2 Bull.	3 Cow.
	Hnd. in.	Hnd. in.	Hnd. in.
Height at shoulder	19 0½	20 3½	19 0
Height at croup...	18 0	19 1	18 0½
	Ft. in.	Ft. in.	Ft. in.
Girth behind shoulder	7 10	8 6	7 6
Tail and tuft	3 3½	3 4½	3 3
Snout to crown of forehead	2 0½	2 3¼	2 4
Length of ears	0 9	1 1	1 0½
„ fore hoof	0 8¼	0 8½	0 7¾
Horns (outside curve) each	2 0½	3 1	2 1
Terminal between the tips	2 7	3 4	1 9
Girth of horn at base	1 6	1 11	1 5
Nape to root of tail, straight	7 5½	7 10	6 10½
Girth of fore leg near chest	2 8½	3 0¼	2 4
Total length from upper lip over forehead to tip of tail, following curve of hump and dorsal ridge.	14 0	14 0	13 3

The ears of No. 1 were much torn and split, and the tips of the horns had disappeared altogether. Those of Nos. 2 and 3 were perfect, as were their horns also.

(Colonel Pollok in "*The Zoologist.*")

FISHING IN INDIAN WATERS.

THE BAHMIN.

BY FRED. ORD. GADSDEN.

Out here in Indian waters—and by Indian waters I must always (except when otherwise distinctly stated) be understood to be referring to salt waters—there is one fish that stands pre-eminently forward as a real good sporting fish. I refer to the Bahmin (*Polynemus tetradactylus*), and yet, though there are many men out here who call themselves fishermen, hardly one in a thousand has ever heard of him. Thomas in that most delightful book of his "The Rod in India" speaks very highly of him, and regrets that personally he knew so little of him. One of Thomas's correspondents remarks sorrowfully that "Bahmin eat a surprising amount of tackle." This is exactly what they will do if allowed.

And now for the fish himself. To begin with, his appearance is magnificent; a large-scaled game-looking fish, he strikes one as being something of a cross between a salmon and an English sea-bass; more handsome than the latter, without being quite so aristocratic-looking as the former.

Other fish have been given the high-sounding title of the Indian salmon; *viz.*, mahseer. seer-fish, and even the nairor "Cock-up," I have heard so called; but in my opinion, if there be an Indian salmon, it is the Bahmin. Beautiful silvery scales, large strong wide-spread tail, powerful dorsal and pectoral fins, with a most marvellously lovely sheen of flesh pink, silver and olive-green tints in his scales; he is, in fact, when just landed, "a sight and a perfect picture for sore eyes."

He lives in the sea, but seems to be very fond of running up the estuaries partly for his food-supply and partly, I fancy, because like his prototype the *Salmo salar*, he cannot do without just a taste of fresh or rather brackish water. He is found all up and down the Malabar and Coromandel coasts. Thomas refers in his book to several places, such as the backwaters at Cannanore, Calicut, Mahi, and Tellicherry and elsewhere; and I have found them, besides at these places, at Paumben, the backwaters off Negapatam, Masulipatam, in nearly all the Burman estuaries and notably in Akyab. Good as most of these places are, not one of them, to use a common expression, can hold a candle to Bombay Harbour.

All who know the latter place will know that numberless creeks and small rivers empty themselves into the upper waters of this magnificent harbour, and that these creeks are full of shrimps, prawns and fry of several sorts of estuary fish. On these our friend feeds, and daily he takes a run in on the flood tide and levies toll. It is a little difficult for the average man to get away from business and it is a long sail or pull to get to these creeks, and if it were not that there exists one spot in the entrance to Bombay Harbour where these fish seem daily to collect, one might never get a chance at them at all. But an all-wise and merciful Providence has ordained that these shoals or packs of ravenous monsters shall collect, probably to compare notes, on this one given spot; and as this is fairly accessible, anyone "in the know" and given to the gentle art, who cares to time himself and appears at the rendezvous, will generally find that he has hit off a rea soft thing; and here, before going any further, I may state a curious fact the reason for which I have never been able to solve. For the upper waters of the harbour, at flood tide seems to be the best; in the lower reach, to which I have first referred, nothing can ever be got on the flood tide, and the best time is invariably from quarter to three quarters ebb. I feel convinced that the conformation of the bottom and the set of the tide have something to do with this, probably in the distribution of their food-supply. Such is however the fact.

In size they run from 3½ lbs. to 14 lbs. Day, in his " Fishes of India," says that they run from 25 lbs. to 30 lbs., and on one or two occasions I have seen natives with even heavier fish in their possession; but they had always been caught far out in the deeper waters and in nets. A 3½-lb. fish is looked upon as small; but one very rarely comes across them more than 15 lbs. I have fished for them pretty constantly, off and on, for about 18 years, not only in Bombay, but up and down both coasts, and the largest I have ever managed to land was 18¾ lbs.: next to that I got one 14¼ lbs.; then I dropped down to the common or garden weight of from 5 lbs. to 12 lbs.; but they must not be despised because they do not run larger. A Bahmin in good order and condition fights as hard, and partly owing to the very heavy water in which he is always taken he is as hard to kill, as a salmon nearly double his nominal weight, and he fights game to the very last.

Having thus described our friend, and but faintly done him justice, let us now discuss the best means of catching him. The natives of course have their own ways—nets, traps, &c.—but these I do not propose to discuss. As he is a real gentleman, there is only one right and proper way of going for him—I mean with a rod and line—and I have found that ordinary heavy pike or salmon tackle will generally hold him.

Some years ago I used to fish with an 18 feet English-built salmon rod with a short stiff top. I discarded that rod later on, as I found it difficult to bring a large fish alongside the boat with so long a rod. I had built some two years ago, by Farlow, a rod which, when I ordered it, I said must be powerful enough to give me command over a 40lb. fish, and yet supple enough to allow me to spin. I told them at the time it was for boat work and the result was a rod which I always maintain cannot be matched for the class of work for which I use it. It is some 12 feet 3 inches in length, greenhart throughout, fitted with bridge and snake-rings, and the top with Jones' patent roller end. It is of the very best material, and springs in one's hand like a piece of tempered steel; and I have now accounted for large numbers of Bahmin and other fish (one being 73 lb. weight) with it, and it shows no signs of stress. I keep also by me two other rods—one a 16 feet spliced salmon rod, also by Farlow, fitted with long and short tops, which I have only lately got, but which is quite as good as my other rod, only being longer is not quite so handy. This rod I use for the spoon or spinning bait, mostly keeping the first-mentioned rod for the prawn. The other is a small trouting rod of the Bickerdyke pattern, by Walbran, of Leeds, and I seldom use it for Bahmin, keeping it more especially for dapping, or, if you like, dry fly-fishing for garfish with a live cockroach, of which more anon some other day.

The reel may be either a Nottingham, or some modified Nottingham pattern, such as the Bickerdyke sea reel; but the reel I generally use and am fondest of is a heavy 5 inch narrow bronze reel, by Patstone, of Southampton, and on it I carry some 200 to 220 yards of Manchester Cotton Spinning Companies 16-plait Egyptian brown dressing. I have also 150 yards of plain Derby silk twist, but I consider it too good for every-day use, and as I should find some difficulty in renewing it out here, I keep that more for high days and holidays. The bait may be prawn, small mullet, or what is called out here "bomalo" fish, better known as Bombay duck.

But generally Bahmin are not particular, and they will very often take an ordinary spoon or bright metal spinning bait as well as the natural; and on one occasion, when fishing from a boat, I had out three rods—one with prawn, one with metal spoon, while I fly-fished over the pair of them with a medium salmon-sized smoky dum, when almost simultaneously I had a run on every rod and, sad to relate, I lost the lot. On another occasion almost the same thing happened, three rods in use, a fish came one after another, the smaller of the three taking the fly first, and by good luck I collared the trio. Weights, 3½ lbs., 11 lbs., and 11¼ lbs., the latter a pair of beauties.

About the best flight there are many opinions. I used always at one time to use gimp with pike flights, but I came to the conclusion that the simpler the gear the better. From that I went to gimp and ordinary prawn tackles with the needle; but one serious objection to this is that powerful fish crunch up ordinary English triangles, and the needles seem somehow to get in the way before the hooks have secured a proper hold—at least that is my opinion; and I can offer no other explanation for the number of misses I experienced when using this tackle. Gimp also has the fatal habit of very quickly deteriorating in this country; and even new gimp, after being used once or twice in salt water, is utterly unreliable, and more especially so because in the monsoon season on this coast (when the fishing is at its best) and nearly all the year round on the Madras side, the climate and atmosphere are more like that of a very hot and damp green-house than anything else, and it is well-nigh impossible ever to get the gimp dry after use, and the consequent deterioration is startingly rapid. All these causes combined led me to discontinue its use, and I now never use it at all.

My traces, which I spin up myself, are of two sorts. One is four-stranded, made of 28 or 29 S. W. G. special soft brass wire spun up in five feet lengths, at the end nearest the line I have attached a buckle swivel and at the lower end an ordinary box swivel; I then cut the trace in the middle, and insert a swivel lead of from 1½ oz. to 2 oz. weight, according to the size and strength of water. Below the lower swivel I twist in one single strand of brass wire, about 6 inches in length, usually 19 or 21 S. W. G., and at the end of this piece of wire comes a 4-4/0 to 7-7/0 Limerick bend hook, and on this hook the prawn.

The reason of the larger wire next the hook is that on account of its size it is stiffer, and as the hook is inserted as low down in the prawn as possible, the wire is available to tie the prawn up to, which I always do with some red cotton. The prawn keeps in good order longer this way, and is kept straight and looks more natural, and as the hook is low down. the fish is unable to get even the slightest taste of what it looks upon as a real bonne-bouche without getting the hook in its mouth.

I think this tackle the best that can be used and the percentage of misses with it are reduced to a minimum. Looking through notes, and harking back to good days, I find that I seldom lose now more than one fish for every six to seven fish landed. Some Bahmin, and those the heaviest, run deep and strong; but the lighter and smaller fish are very much given to plunging and jumping, and a large percentage of these latter are lost. One additional advantage of this tackle is there is nothing to spoil or rust. All the trace is made of brass throughout, and so are the swivels, &c. The only thing is the hook and that one can afford to discard when worn or rusty.

I mentioned further back that my traces were of two sorts. The one I have described; the other is a modification of this. The length and the general arrangements are the same, only that in this case I use six strands of a much smaller-sized wire. No. 35 S. W. G., if I can get it, is what I like. It makes a beautifully elastic and flexible trace, free from all liability to kink; and provided I could always get the size and quality I like, which is not easy, I would myself never use any other. These traces are suitable for nearly all sorts of general sea-fishing out here. There are times however, such as when one goes dapping for garfish, when gut, and fine gut at that, must be used, and about which I may write some account on a future occasion.

I have spoken of the Bahmin as a most voracious and ravenous fish, and when he is about, you are not left long in doubt as to his intentions. He appears to be always in a violent and cast-iron hurry, rushing about all over the place, and causing the smaller fish and fry to jump and fly about. One of the first and surest signs of his presence is the jumping about of the small razor fish, and if you have had no sport up till then, when you see this you may cheer up, for your friend is not far away. He is, when hooked the most determined brute, and will fight till the last gasp for his life, and to illustrate this trait in his character I will, with your permission, relate a true story.

An old friend of mine, a Captain F——, was out with me one day. He was a very keen angler and though the Bahmin gave him every chance, on that occasion he did not manage to creel a single fish. When he came back in the evening he was asked by a guest at dinner how it was that he had got none, and this was how he explained it. He related in the most vivid manner, and with the greatest detail, how he had struck and hooked a monster, and also how he had run him up and down for I don't know how long, and proceeded to say how, on one occasion, when he had nearly got the fish into his landing-net, the fish opened its mouth, and showed him very plainly the hook, right deeply embedded in its tongue (Bahmin, by the way, have no tongue proper), and then rushed off and cavorted about again afresh. Things however came to a pass eventually, and my friend led his fish up to the net once more, this time quite certain of victory, when according to his narrative, " hey presto! " the Bahmin opened its mouth, and, showing the hook in its tongue once more, winked his left optic and, deliberately biting off his own tongue, left it on the hook for my friend to land, and swam away.

The look of surprise on the guest's face when he heard his explanation can be better imagined than described. Whether he believed him or not I do not know, but I do not think he ever asked him again as to the cause of his non-success.

On the Coromandel Coast, where there are numberless creeks and backwaters, which are nearly dry every low water, they seem to run in and out every tide all the year round, and almost invariably begin to run very shortly after the tide has made. On both sides of these backwaters for the most part, there are extensive mud flats, swarming with prawns and small deer of sorts, and the fish are on these as soon as ever there is water to float them. They work upwards and onwards until they have satisfied their hunger, and then rush back to the sea, knowing full well that if they did not when the water receded in many parts, they would be left high and dry ; and therefore, if it is intended to fish these backwaters, the thing is to be there by low water, as near the bar out to sea as possible and wait there for their appearance. Should they show up, as in nine cases out of ten they will, offer them the prawn at once, right slap on the nose if you can, and watch and follow them up.

They will generally be found to be advancing a little slower than the tide is making. You must lose no time and must give very little law. Remember that at the outside you will have only about three hours at the most, and you must do all you can in that time ; else, as the creeks fill up and get bigger, you will loose touch with them. This is the general rule with the small estuaries and creeks. I remember one day in February, 1893, getting such a chance as I had never had before or am likely to get again. I had landed on purpose at dead low water at the bar of one of these creeks, close to Negapatam, and had no sooner got my gear together than the run began.

For about three-and-a-half mortal hours I did nothing but tussle with fish, every throw was accepted and I verily believe that day that they would have run at a bag of scupper nails. As each successive fish was hooked, I hung on for dear life till the shoal had passed on ; I then played and landed the fish as quickly as I could, and then hurried on as best I could over the half sandy and half muddy foreshore till I came up with the shoal again, and again and again took toll. And so the game went on.

It was a frightful hot day with the burning sun, and my arms were like to drop by my side ; but I could not resist the excitement, and the native boatmen from the ship, who had landed with me, seemed to enjoy the fun.

After going on like this for $3\frac{1}{2}$ hours, I was stopped from following them further by a large cross creek, which we could not cross as the tide by that time was too high, and though very tired and very thirsty, I had to turn back. Not another fish did I see on my way back ; but I was quite satisfied. We picked up the fish at the different places as we went back, and the tally at the end was 19 fish. It was on this occasion that I got the $18\frac{3}{4}$lb. fish. He was the largest, and the smallest just turned 3lbs., but there was no other so small, and the average size was about 11lbs.

Only once since then have I managed to visit that creek, and though I went as before, and fished as carefully, I only caught three. I do not suppose it will ever be my luck to visit that place again, nor do I ever hope to have such another take. Although, as I have here explained, it is best to catch the first of the flood on these small creeks, it does not at all follow that the flood is everywhere the best time. In the larger harbours, and notably in Bombay and Karachi, the ebb is not only the best but practically the only time to get them. The reason for this I have tried to explain elsewhere. In Bombay the best months are the monsoon months of June, July, August, and September, and the worse the weather the better the day. But a landsman will hardly enjoy Bombay Harbour when the monsoon is on. Though I have never had any such basket here as I have described, in the last three or four years I have only had one or two blank trips, and my average is four to five fish per tide. This year I have had 37 fish in eight trips (largest 12lbs.); bait, prawn ; time, $\frac{3}{4}$ ebb ; bright day, with a moderately heavy sea running. Choose, if you can, spring tides. I recommend any who intend trying to make enquiries, and if they can only find a decent getatable place where these fish are in the habit of congregating and running, by all means try for them. They are the best and gamest fish we have out here, and almost the best for the table. They have been a great source of amusement to me now for many years, and have helped largely to lighten ennui and while away the many weary hours out here in what Sir Alfred Lyall calls "this land of regrets."

The above was written for and published by "*The Fishing Gazette*" in 1897, but since then I have been out on several occasions with varying results. On one occasion I hooked and eventually landed a fish which, at the time, I thought was going to prove the biggest fish I had caught. The run was felt as usual and at once I recognised I had a heavy fish. As things proceeded I mentioned to the friend who was with me my extreme desire to get a 20 pounder, and my idea that this would turn out to be *the* fish. A good half hour's desperate run backwards and forwards without a glimpse of my friend, strengthened me in this idea, and I was greatly disappointed when he turned up into the net, and only turned the scale at 11½ lbs. The reason for the deception was plain. He had been foul hooked outside on the underneath side of the throat, half way between the pectoral fins, and that accounted for the very little control I was able to get over him. It was the first time for many a long day, that I have had my fingers burnt, but whether through carelessness or clumsiness, I got the two first fingers of my right hand badly burned. I suppose he had been mouthing the bait when I first felt him, discovered the danger latent therein, dropped it, and had begun to clear out when the stroke was given which firmly fixed the hook in his throat, only outside instead of in. He was a good fish and paid the penalty gamely. He was one of four killed that day—August 14th 1897—all of which were above the average in size. Another day—September 11th, 1897—will always remain a red letter day to me. I went out from 1-30 p.m. to 4-30 p.m., I was actually fishing for 2 hours 10 minutes out of this time, and during that time I caught 13 fish of the following weights:—13¼ lbs, 11¾ lbs, 11¾ lbs, 11 lbs, 10¾ lbs, 10¾ lbs, 10½ lbs, 10½ lbs, 10 lbs, 9½ lbs, 8 lbs, 5 lbs, 4½ lbs. Total, 127¼ lbs. Tide, 4′-5″. Wind W. by S. 4. The thirteenth fish—one of the bigger ones—plunged clean through and broke my landing net, but was eventually landed. At the same time I had run short of bait. But for this misfortune I am convinced that I should have caught a good many more as there seemed to be no scarcity of fish about. In addition to the thirteen landed, I ran and lost either seven or eight. From the fact that there were so many fish about I realised that I could not afford to loose time over each individual fish and therefore played them rather more roughly than I otherwise would have done, and in consequence, lost my fish. As an instance of how ravenous they were, I may state that the first five throws secured five fish, and once while clearing the line, which had fouled the point of my rod, the prawn hung down about six inches off the water. A wave surged up and at that moment a fish took the prawn. His plunges nearly took the rod out of my hands and as nearly as possible broke the top. Luckily the line had just been cleared, it ran free and I got that fish. Such was my best day last year. This monsoon for some reason or other the fish have been conspicuous by their absence. I have had unfortunately more blanks this year than I have ever had before, but I had one experience this year which was entirely new to me. On Saturday, July 23rd, 1898, I went down to the Sunk Rock accompanied by Mr. E. R. Jardine. Shortly after we had commenced fishing, Mr. Jardine had a half offer from a very large fish, which came to the top of the water after the prawn, but stopped short. Immediately after, presumably the same fish made a rush and took one of a small swarm of garfish swimming about, and having taken this again came to the top of the water and then deliberately swam across to where I was fishing. I threw in where I thought he might possibly be, and at the second attempt, had a very modest offer. To this I struck, and then at once he shewed himself. He began by making a series of very short sharp runs, zigzagging backwards and forwards, and at the end of each rush he made a series of magnificent leaps out of the water, rising out some three or four feet, but covering certainly 10 or 12 ft. in each leap. Thus he was plainly visible and all this time he had not got more than perhaps 25 to 30 yards away. The natives called it "Dagole" and from what I could see of it I imagine it must have been a *Cybium* of some sort, probably *Cybium guttatum* or *Thynnas pelamys.* Its apparent length was roughly some six feet, and I do not think that I am overstating its weight when I put it down to be between 60 and 70 lbs. However, after carrying out these tactics for some 15 minutes or so, the fish had evidently come to the conclusion that that neighbourhood did not suit its delicate constitution, for it turned tail and proceeded with a fearful rush to go straight out to sea. Having run out some 100 yards or so he again threw himself straight up on end out of the water and then made a further rush. He had got away some 180 yards by this time and again he made a supreme effort, and this time while in the air the line came back to me, and he was off with a No. 7/° hook, about 4 ft. of steel wire trace and 1½ oz. lead and 3 swivels. On examining the remains of the trace I found it kinked and twisted at the point of fracture and I wonder now that it held out so long. But this is not a Bahmin experience and so I stop, but I live in hopes that I may again on some future occasion make the acquaintance to some better purpose of my friend the "Dagole." Referring back for one minute to the 18¾ lbs. Bahmin, I intended to have given his dimensions. Circumstances over which I had no control prevent me now from giving any other measurement than that of his length. It is notched off on my rod handle and taken from the extreme end of the caudal ray to the tip of the nose, the length was 2 ft. 11¼ inches.

MISCELLANEOUS NOTES.

No. I.—BIRDS NOT RECORDED FROM TRAVANCORE IN THE "FAUNA OF BRITISH INDIA."

108. *Argya subrufa.*—The Large Rufous Babbler.

The southern limit of distribution of this bird may be extended to the hills of Travancore. My collector shot a female and young one fully fledged at Ponmudi at an elevation of about 2,000 feet in April 1895.

166. *Rhopocicula atriceps.* The Black-headed Babbler.

Recorded from the Nilgiris, but not further south. It is found on the hills in Travancore over 2,000 feet.

313. *Micropus phœocephalus.*—The Grey-headed Bulbul.

The distribution of this bird is said to be "the Western Coast of India from about Anjango in Travancore to the vicinity of Belgaum." I doubt its ever being found near Anjango, which is on the sea coast, where there is no jungle but only coco-palms. It is eminently a bird of the jungles, going about in small parties, and frequenting thick undergrowth in heavy forest. Oates says, "This appears to be a rare bird." It is not so in Travancore, where it is found in the hills of both the north and south.

499. *Pericrocotus roseus.*—The Rosy Minivet.

"The distribution of this species over the Peninsula of India has not been ascertained with any degree of accuracy. Jerdon records it from Malabar and Lord A. Hay appears to have procured it in the hills dividing Tinnevelly from Travancore, as mentioned by Jerdon." I am able to confirm this as I have two specimens, male and female, shot at Ponmudi in January 1894.

580. *Stoparola sordida.*—The Dusky-blue Flycatcher.

This bird is only recorded from Ceylon, where it is said to be a resident up to 2,000 feet. It is not uncommon in the Travancore hills, but is only found at elevations considerably over 2,000 feet.

581. *Stoparola albicaudata.*—The Nilgiri Blue Fly-catcher.

Distribution, "the Nilgiri and Palni hills." It is the Fly-catcher most often met with at the higher elevations in Travancore. It has a very sweet little song.

691. *Petrophila cinclorhyncha.*—The Blue-headed Rock Thrush.

Distribution "in winter throughout the plains of India as far south as Coorg, the Nilgiris, and probably to Cape Comorin." I may say certainly to Cape Comorin, as I have several specimens from the hills of South Travancore.

761. *Carpodacus erythrinus.*—The Common Rose Finch.

"A winter visitor to the whole of India, as far south as the Nilgiri hills." It also visits the high range of North Travancore, but not further south than this.

842. *Anthus nilgiriensis.*—The Nilgiri Pipit.

"The higher parts of the Nilgiri and Palni hills." I have one specimen from Ponmudi in South Travancore.

909. *Arachnothera longirostris.*—The Little Spider-hunter.

Not recorded south of the Palni hills. This bird is found in South Travancore. I have three specimens from the hills.

916. *Dicœum concolor.*—The Nilgiri Flower-pecker.

Not recorded south of the Palni hills. It is fairly common throughout the whole of the Travancore hills.

919. *Dicœum erythrorhynchus.*—Tickell's Flower-pecker.

Found in South Travancore, both in the plains and on the hills.

972. *Liopicus mahrattensis.*—The Yellow-fronted Pied Wood-pecker.

I have two specimens from Kuttyani, about 10 miles from Trevandrum.

1001. *Picumnus innominatus.*—The Speckled Piculet.

"This species has also been found very rarely in the hills of Southern India, near the west coast in the Wynaad, by Mr. J. Darling, and by Mr. W. Davison below Kotagiri in the Nilgiris." I may now add the Travancore hills, as I shot a specimen at Chimunji in April last and saw another on the same day; both in heavy jungle, at an elevation of 4,000 feet.

1045. *Halcyon pileata.*—The Black-capped Kingfisher.

"A single specimen was obtained by Jerdon at Tellicherry, Malabar coast, and another by Layard in Northern Ceylon." The only other known locality in India is on the Ganges. A live specimen taken near Trevandrum was brought to me, and it lived a short time in captivity.

1117. *Surniculus lugubris.*—The Drongo Cuckoo.

"Apparently very rare in the Peninsula of India, having been observed only near Raipur, on the Godavari below Sironcha, and perhaps at another locality in the Southern Central Provinces (Jerdon's locality in Central India); also in the Wynaad and Malabar coast-land." I have three specimens from Kuttyani and another from Trevandrum.

1119. *Coccystes coomandus.*—The Red-winged Crested Cuckoo.

"This is a very rare bird in India." Jerdon states that he saw it in Malabar and the Carnatic, and that it has been found in Central India (? Chutia Nagpore). I have two specimens from Ponmudi in South Travancore shot in 1892.

1170. *Huhua nepalensis.*—The Forest Eagle-Owl.

I have never shot a specimen of this grand owl but have had specimens brought to me alive on two occasions, and have kept it in captivity for a considerable period. I have one now in the public gardens, which was brought to me five years ago.

HAROLD S. FERGUSON.

TREVANDRUM, May, 1898.

No. II.—THE ÆTHIOPIAN WART HOG, (*PHACOCHŒRUS ÆTHIOPICUS.*)

(*With a Plate.*)

In his paper on the Mammalia of Somali Land in Vol. VI of the Society's Journal, Mr. Inverarity has introduced us to the Wart Hog and given sportsmen a fund of information about his measurements and habits, which it would be superfluous for me to repeat here ; suffice it to say, that the tushes of the specimen figured in the plate measure, on the outside curve :

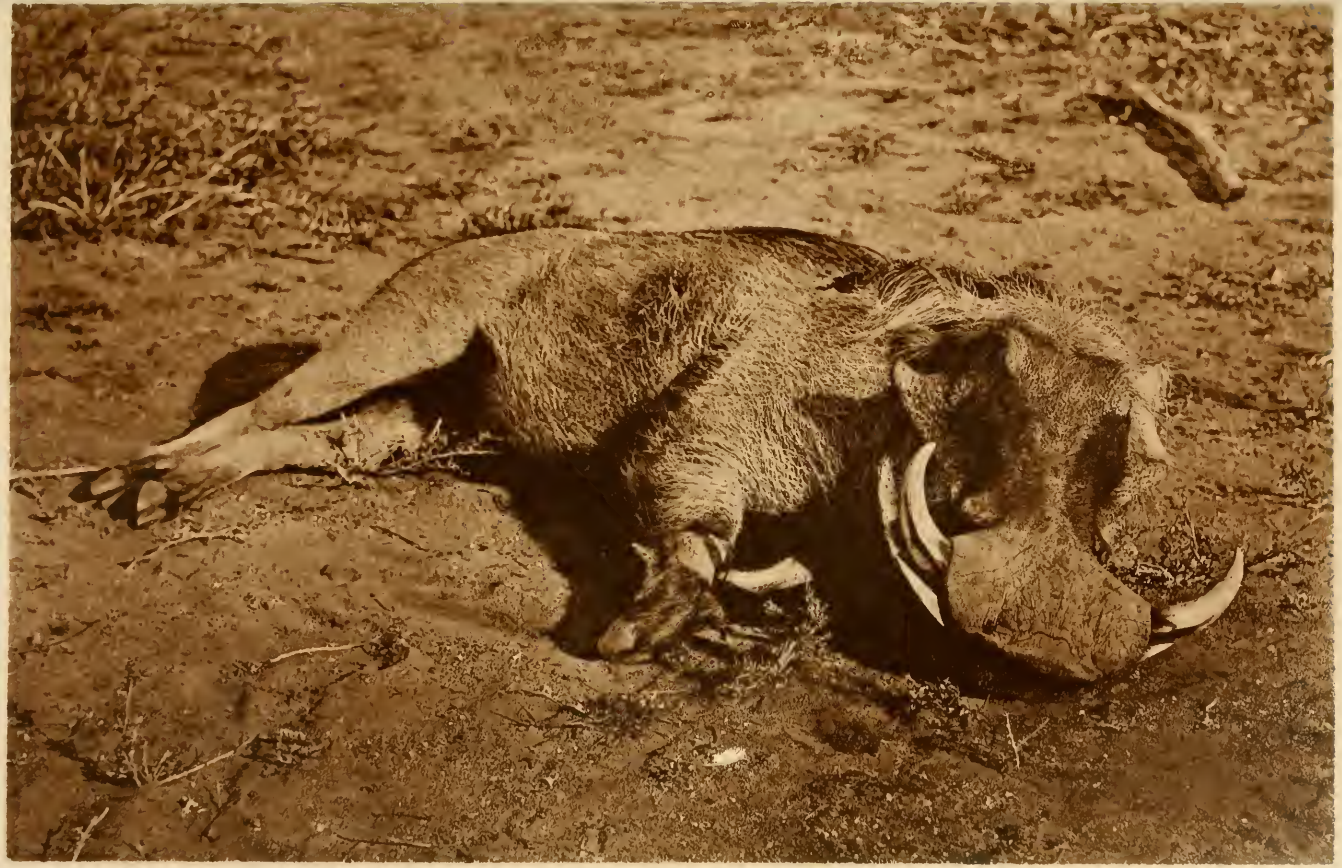
Upper Tush	10½″
Lower do.	9″

The impressions which follow, as an accompaniment to the plate, are recorded in the hope that some of them may prove of interest to the general reader.

Let me first make it clear that the christian name of this Hog has no connection with " Water." I have had a couple of stuffed boars' heads on the walls of my dining room for some years, and my experience in the occasional rôle of cicerone during that time has shewn me that it is quite a common impression among sportsmen and others, not personally acquainted with the animal, that the word " Wart " is the Dutch or other foreign rendering of " Water." " Wart " is of course the English word and refers to the four excrescences or warts on the face, but I think it well to repeat the fact, even at the risk of being accused of instructing my grandmother in the art of preparing eggs for the cabinet. The mistake after all is not an unnatural one, for so many of the popular names of the big game of East Africa have a Dutch origin.

Formerly Zoologists (those of Germany at any rate) made two species of the Wart Hog, differentiating the breed found at the Cape and in South Africa generally from that met with further North and in Central Africa. The former variety was classified as " *Æthiopicus* " and the latter as " *Africanus.*" The differences, however, such as they were, were small and unimportant, and it has eventually been decided, as far as I can gather, to make the Wart Hog a single species under the name of " *Phacochœrus æthiopicus.*" It is probably found all over the continent of Africa, though rare now in Cape Colony and the south generally—it is, however, as a native of the Somali Protectorate that I am now dealing with the animal.

In the matter of grotesque ugliness an old Wart Hog boar may, I think, safely aspire to " lick creation " with small fear of competition. I ask you, gentle reader, can you conceive any living creature with a more villainously ugly physiognomy than the subject of the accompanying plate ? Mark the huge head, out of all proportion to the rest of the body ; the short bull-neck ; the extraordinary development of the upper lip ; the beady, evil looking eyes with their apoplectic expression ; the narrow forehead with its



Photographed by Cap. P.Z. Cox.

Mintern Bros Photo imp. London

THE ÆTHIOPIAN WART-HOG.

Phacochoerus æthiopicus.

shaggy fringe of coarse grizzly hair; and lastly the four uncanny warts upon the face. Where could you find a more repulsive type of countenance? To a great extent however the Wart Hog's looks belie his character, and while admitting that his style of beauty is not calculated to engender love at first sight, my own experience of him is, that the more you see of him, the better you like him, and that as far as character goes, the race has been much maligned—it has been a case of give a *Hog* a bad name and hang him.

Rowland Ward in his "Records of Big Game" writes:—"It is an undoubted fact that neither of the African Wild Boars—the Wart Hog and Bush Pig—exhibit anything like the pluck and determination of their Asiatic or even European cousins" and I have seen strictures of the same kind in the writings of other sportsmen, but I am at a loss to know what has given rise to them. I hope, and cannot help believing, that they are calumnies and that the contempt for the grizzly boar of Africa, which has from time to time been given expression to, is bred not of familiarity, but of the want of it. The reasons for the want of it are not far to seek. The ground where the Wart Hog is found is often fair hunting country enough, and though he is mainly a night feeder, solitary boars and small sounders are often encountered in undisturbed jungles, either on their way home in the early morning, or when starting out to feed in the evening—in fact in cool weather I have not infrequently seen them at all hours of the day, but the truth is that the sportsmen who usually meet with and record their impressions of the animal are men on long shooting expeditions of several months' duration, hampered with large caravans and having no horse flesh with them of a class fit for a long burst after a pig. No highly bred horse accustomed to careful grooming and feeding will stand much marching in Somali Land away from the Coast. You cannot carry large quantities of forage for your quadrupeds, it would largely increase the size and cost of your caravan at the start, and the supply once exhausted could not be replenished. The pony indigenous to the country and endowed to a great extent with the habits of his Somali master, is the only one of any use on a long trip. His wants as regards care and toilet are few, he lives on what grass he can pick up and can go for much longer without food or water than his civilised brother, and when he cannot get water he has no objection to milk. On an ordinary Shikar expedition he is probably seldom taken out of a walk and only used when changing camp or for riding for a short spell when the sportsman is tired of walking. He is not shod and after a time is generally more or less footsore and tender. It will therefore be readily imagined that pursuit of the wily boar on such a mount would be a source of very little pleasure either to the horse or his rider.

Consequently, in drawing comparisons between the Wart Hog and the Indian or European boar, it must be remembered that the former usually falls to the rifle and not to the spear. One can easily understand that a prod or even a fair thrust with a spear would be an incentive rather to courage than to cowardice, but what animal of the Wart Hog's size would have any fight left in him after the receipt of an express bullet in his vitals, propelled by 4 or 5 drams of powder? Fairly ridden with a spear, is there any evidence forthcoming to show, or evidence to suppose, that a well furnished African boar will not acquit himself as valiantly as the congener of this continent?

Of South Africa I have no firsthand experience in this connection, but I have met a good many South African sportsmen and have never heard or read of any systematic hunting of the Wart Hog with a spear in that quarter. Captain C. J. Melliss of the Bombay Army is the only man who, to my knowledge, has scientifically pigsticked him, and I am sure I shall have that good sportsman with me when I essay to clear the character of the Æthiopian Hog from what I believe to be unmerited charges of want of pluck. Captain Melliss has given a graphic account of his experiences while at Zaila at the end of his book "Lion Hunting on Somali Land", and tells of many a good-plucked boar that has tried conclusions with him *à outrance.*

As I have pointed out above, sportsmen on hunting expeditions in the interior of Somali Land are seldom in a position to tackle the Wart Hog with a spear, but Captain. Melliss was differently situated and did not exploit him under the same conditions. He was quartered at Zaila on military duty and had an Arab horse with him which was a "salted" Indian pigsticker; and, moreover, his duties being light, he had no difficulty in occasionally getting out for a week at a time for a quiet pigstick.

I was there six years later, but by that time all the jungle within a day's excursion of the coast, which used to hold pig in Captain Melliss' time, had been grazed down or cut for fuel, and as it no longer afforded any cover, the pig had retired to pastures new and further afield. I had in my service his quondam shikari Abdulla who knew all the ground that held pig, but I never succeeded in finding them within a day's excursion, and standing orders prohibited my sleeping out the night, so after many unsuccessful attempts to locate them I gave up the quest.

There is no doubt whatever about the Wart Hog retiring to holes and burrows; more than one sportsman has witnessed the operation. If handy, they appropriate the earths of other animals, but if not they make use of their tushes to dig their own. In this connection Sir John Willoughby relates how he ran a wounded boar to earth, and Captain Melliss on one occasion bolted two pigs from a large burrow.

Setting aside Captain Melliss, whose experiences of the Wart Hog in Somali Land have been unique, we find that there are two causes which combine to make the species at all times but a small item in the butchers' bill of shooting expeditions to that happy hunting ground. The first exists perhaps chiefly in the case of the sportsman from India or with Indian experience, who is generally imbued with an instinctive reluctance to kill with the bullet an animal which from his youth up he has been taught to look upon as fair game for the hog-spear only. The second cause is that the Somali is a most bigoted Mahommedan who will not lay a finger on the unclean beast for love or money, so that if you are bent on preserving a good head you must be prepared to carry what you want of your boar home and do all the skinning and cleaning yourself. Even when you have got off the mask and cleaned the skull to your satisfaction, your labours are by no means ended, for not one of your dainty retainers will touch the skull or turn the skin, and if marching you must with your own hands load them up day after day until the objectionable items have been forgotten by your men or are dry enough to be packed away out of sight.

Many parties, when starting from the Coast, make a point of enlisting among their followers a man of the Midgan tribe (one of the Pariah castes of Somali Land) on purpose for this kind of work, and there is never any dearth of applicants for the appointment, who, in return for the Sahebs' plentiful bawbees, are willing, according to their own account, to take any liberties with a Wart Hog alive or dead; and so they would, no doubt, among their own people, but it is a very different matter when you get them into a caravan among a lot of well-bred Somalis, strict followers of the prophet at any time, and specially so when members of a sportsman's caravan, where there is no concealment and where a man's every act is known to his fellows.

Never shall I forget the life led by an unfortunate Midgan whom I once had with me for such purposes on the first hunting trip that carried me far into the interior. I was primarily on duty, my mission being to try and win over an important tribal Chief whose country was on the confines of the Protectorate and who though owing allegiance to us was credited with playing into the hands of the emissaries of "the King of Kings" and, with a lively sense of favours to come, conniving at the passage through his country of raiding parties of Abyssinian soldiery from their outpost at Jigjiga. To these he gave secret information of the whereabouts of rich nomad encampments of his fellow countrymen, and their marauding parties were thus enabled to nip across the border as opportunity offered. Armed as they were with rifles, they had no difficulty in overawing the tribesmen whom they encountered, and after taking their pick of the fat kine of some rich nomad village, they would make tracks for Jigjiga with their spoil. Such at any rate were the current reports. The route from Zaila to this Chief's summer habitation lay through some good country from a sportsman's point of view and a brother officer from Aden joined me in the hope of getting some shooting by the way. I was anxious, among other things, to get a good specimen or two of the Wart Hog, and, to this end, before leaving the coast, took much trouble to select a Midgan of the most unsophisticated type who confessed to have no scruples whatever as regards handling Wart Hog or any other unclean beast. Nor had he as far as he personally was concerned, but that was a point which unfortunately proved to have little to do with the question. We had a good deal of wet weather on the journey out, so much so that a few days after leaving the coast, my companion was prostrated with a sharp attack of malarial fever and dysentery; and as we had reached a spot where there was plenty of wood and water, we determined to halt there for a day or two to enable him to pull round. The whole time we were at this camp it rained almost incessantly ; our tents were saturated and everything and everybody very wet and miserable. Our following of camel-men, shikaries, etc., had of course no tents, but according to their custom had rigged up two or three " gurgies " or huts for themselves out of " herios ," (the fibre mats used as numdahs for the baggage camels) and in these they squatted cheek to jowl, waiting, with philosophic patience worthy of Micawber, for something to turn up. The second evening there was a little break in the weather, and I was sitting at tea with the invalid preparatory to going out to shoot something for the larder, when my small waiting boy Yusuf came running up excitedly to tell me in his crude English that two " Bacon," as he naively called them, were feeding across the river bed within sight of camp. My Midgan was away from camp at the time tending our camels at graze and the shikaris were out scouting, so piloted by Yusuf I started off to where he had seen the pig. By the time we had crossed the stony river bed they had disappeared into the jungle fringing the further bank, but, after a longish run at my best pace parallel to the direction in which they were making, I at last got a broad side shot and accounted for one of them—a boar with fair tushes. Yusuf was by way of being a strict, if juvenile, Mahommedan, and in any case was not likely to be of much assistance to me, so I sent him back to camp to try and get hold of the Midgan. Meanwhile I started the laborious job of decapitating the dead boar. It was no easy matter to worry, through the bull neck and sever the vertebræ with an ordinary hunting knife, and when the operation was finished it was nearly dark and as yet no sign of the Midgan, so I had to make the best of a bad job and carry the head and my rifle back to camp, about a mile away. By the time I got in the Midgan had returned and I told him to get to work at once on the headskin, but in spite of his previous protestations he at first absolutely refused to touch it and it was only by dint of much persuasion both moral and physical and by threatening to turn him out of camp in the morning and let him find his way back to Zaila as best he could, that he was at last prevailed upon to obey. Then the play began.

It came on to rain again while we were at dinner and all the men made for their improvised huts, prepared to remain there for the night ; but the poor Midgan who had begun to carry out his compact and by this time was thoroughly defiled, now began to have a sorry time. He was expelled from his " mess " ; his food was thrown to him as to a dog, as he sat beside the

Wart Hog relics in the middle of our small camp, and there he remained disconsolately eating the bread of affliction (in this case his allowance of dates and now sodden rice), devoutly wishing, I am sure, that he had even braved the dangers of a solitary tramp back to the Coast rather than let himself in for this fore-taste of purgatory. When he had disposed of his portion he slunk about from one hut to another trying to get squatting room and shelter, but no one would let him come within striking distance and, after trying to insinuate himself into the several huts without success, he at last came to us in despair and we gave him sanctuary under the outer fly of our tent. There he curled himself among our gun cases and provision boxes and slumber soon came to his relief ; not to ours, however, for his terrific snores kept waking us on and off the whole night through, but we had not the heart to turn him out and contented ourselves with heaving an occasional " brickbat " in his direction. For about a week he led a perfect dog's life and was a Pariah in very truth, but after the boar's skull and mask had dried and been sewn up in sack cloth and thus removed from sight the incident was gradually forgotten, and the Midgan was in due course received back into the fold, but I am afraid only partially so, for to the end of the chapter he seemed to come in for more kicks than halfpence when I or my companion were not looking.

Though he has no further connection with the heading to my note, I cannot quit this incident without a short account of the boy Yusuf above mentioned, and trust I may be forgiven for the digression. He was such an extraordinary character and had such a curious history, that it seems worth recording.

In 1893 I was in political charge at Zaila, and one day towards the end of the hot weather an old Turk who eked out a precarious existence at a coffee stall in the native town brought to my office a small fair skinned boy apparently about 10 years old, accompanied by the headman of a coffee caravan which had just come in from the Abyssinian outpost town of Harrar. The latter reported that the boy was the orphan son of a Turk who had migrated to Harrar during the Egyptian occupation and had married an Abyssinian woman, of whom Yusuf was the offspring. Both the father and mother had died of cholera 3 or 4 years back, since when the boy had had to shift for himself, and as he had become a confirmed thief (having in fact no other means of livelihood) he had been expelled from Harrar by the Abyssinian authorities and my informant had been asked, when returning to the Coast with his caravan, to take Yusuf with him and hand him over on arrival at Zaila to the old Turk now present, who was said to be a relative of the boy's deceased father. This the latter admitted, but pleaded, and I knew with truth, that he barely earned enough to keep himself and his wife in the bare necessaries of life, and could not possibly maintain and look after this boy as well, especially as he appeared to be very ill and would not be able to do any work for months. The apothecary was close at hand, so I had the boy examined there and then and he was pronounced to be saturated with malaria from exposure ; his spleen too was very much enlarged. I determined therefore to hand him over to my Goanese cook and see what could be done for him. If he recovered I thought he would make a useful little dogboy and that my wife, whom I expected in the cold weather, might be able to make something of him. For some weeks he was too weak and ill to give much evidence as to how he was likely to shape, but care and regular feeding gradually put him right and it soon became apparent that his wits had been much sharpened by privation and that he was a very smart boy. In the first two months he picked up Hindustani from my cook and could talk quite fluently, and he could also speak Amharic, (*i.e.,* Abyssinian) Galla, Somali, and Arabic. By the time my wife arrived he was a bright, spry little fellow, but even at his tender age he was imbued with every vice the flesh is heir to, and this soon became evident as his health returned. He drank, smoked, took opium when he could get it, and was up to every sort of devilment. I was a keen conchologist at the time and used to take him out with me shell hunting—he soon got to know what was rare and what I wanted—and at once made use of his knowledge at my expense. I found one day that he had extracted several rare specimens from a jar of shells that I had left to clean on the roof buried in sand and had handed them over to two local Somali urchins whom he subsequently introduced to me as having found some shells that I badly wanted. I was delighted to get the specimens and gave the boys liberal bucksheesh, but when making a more minute examination of ;them I recognised one of them as being my own property owing to its having a slight malformation. Then the cat was out of the bag ; I went up to look at my jar on the roof and discovered the urchin's perfidy, but by this time master Yusuf had decamped to the bazar with his protégés to spend the result of his successful enterprise. For this atrocity he received condign punishment, " in the .manner of school discipline," the only form of correction which had anything but a momentary effect on him.

For a long time it was never safe to give him any money, as the old Egyptian bungalow then occupied by the Political Officer was in the middle of the native town, and on the first opportunity he would slip out and waste it in treating himself and any juvenile Somalis that he could find to a drink or some tobacco. I eventually broke him, for the time at all events, of his taste for spirituous liquors, but never succeeded in curing him of smoking. If I stopped his supply he would collect all my cheroot ends for secret consumption, and finally as I found that he got quite ill and good for nothing if he did not smoke, I had to give him a regular ration of tobacco.

My wife took an immense deal of trouble with him and endeavoured to instil a little elementary morality and self-respect into him. In the course of time she made him into a very useful little table servant and for months he would be as good as gold ; then something would happen to upset him, and he would break out again into some rascality. With all his vices he had something attractive about him, and was possessed of one or two good qualities which made us forget his bad ones. For instance, he was generous to a fault and devoted to animals, and tender-hearted to a degree where they were concerned. We banked his pay for him, only allowing him Re. 1 per month pocket money, but occasionally he would get a windfall unknown to us in the shape of a tip from some passing sportsman, and on such occasions he would say nothing about it until he had spent the money ; but we always found that he had shared it with somebody else. On one occasion I remember his getting Rs. 3 from some guest of ours, he at once disposed of it as follows :—

Re. 1 drink in the bazar for himself and friends.
„ 1 for a pet goat.
„ 1 to a mendicant who had befriended him in Harrar.

When I left the country on leave to England it was difficult to know what to do with him. He was such a thief that one could not recommend him to a stranger and yet we were loth to leave him to go back to his evil ways. He refused to go to school in Aden and was offered the choice, either of remaining in the charge of the Missionary Fathers at Berbera and being educated at their school until I returned from leave, or else of being sent back to Abyssinia. At first he said he would stay with the Fathers but some one put it into his head that they would force him to become a Christian, so he changed his mind and elected for Harrar. His deferred pay amounting to some Rs. 50, was handed over to a responsible man travelling from Zaila to Harrar who was to take Yusuf with him and dole out his money as he required it. He reached Harrar safely but I heard afterwards that he had soon wasted his substance and relapsed into evil ways. Soon afterwards he returned (probably having been expelled from Harrar) to Berbera where he was living by his wits when last heard of. Poor boy, I often think of him with regret ; had he been rescued earlier he might have become a respectable member of society, but we got hold of him too late. If fate should take me back to those shores on work or pleasure bent, Yusuf and I may meet again and if he is not a hopeless criminal by then, I hope I may have another chance of reforming him ; meanwhile his little personality remains in my memory as the most extraordinary mixture of good and evil that I have ever come across.

One more reference to the Wart Hog and I have done. In 1895 I was collecting some animals for the Calcutta Zoo, and among them had a pair of baby Wart Hog. They were the nicest little creatures imaginable—not striped like the Indian porker but coal black with little shiny hairless skins. Under ordinary circumstances I should have tried to make pets of them as they were very tameable and always beautifully clean and sweet, but at the time I had two young hunting cheetahs loose in the compound and was afraid they might bring the little strangers to grief, and as the latter were only mine on trust, I thought it safer to keep them in a spare room, where they seemed quite happy. Before they left for Calcutta they got to know me and my wife quite well and whenever we walked past the window or opened the door they would run up to greet us and see if we had anything to give them, their dainty little feet clicking like small castanets along the cemented floor. They arrived safely at the Calcutta Zoo, but I am grieved to hear from the Secretary that after thriving there for 5 months they succumbed to the climate, as did the several other specimens of Somali Mammalia that I sent at the same time. Two Giant Tortoises are the only present survivors of the shipment.

P. Z. COX, Capt.

Baroda, *August*, 1898.

No. III.—SOME NOTES ON THE NARCONDAM HORNBILL, ETC. (*RHYTIDOCEROS NARCONDAMI*).

During one of our cruises round the Andaman Islands with the present Chief Commissioner, that gentleman expressed a wish to go to the Island of Narcondam with the object of seeing the island, and also to obtain some specimens of the Hornbills (*Rhytidoceros narcondami*) which are found there and which are quite distinct from any of the Hornbills of India; the only specimens recorded up to now having been a pair obtained on the island by Mr. Hume as far back as 1873. The Island of Narcondam is quite isolated from the Andaman Islands, and is in a direct line between Port Blair and Rangoon. It is 140 miles from Port Blair, and although some authorities have stated that it is an extinct volcano, it has since been proved that the island is not volcanic, and it is supposed that the above authorities confused it with Barren Island, which is about 75 miles further south, and which is a distinct volcano. The highest part of Narcondam Island is 2,330 feet above the sea-level, and as there is very deep water close up to the shore, it does not provide any anchorage for ships, with the exception of a very small and unsafe anchorage to the north-west of the island. It is only on the rarest occasions that landing is possible on this island, as the seas break heavily even in a light breeze. This difficulty of landing, and the fact of the island being so isolated, has probably been the reason that the Narcondam Hornbill is so rare a bird. No mercantile steamers ever call at the island; men-of-war seldom go near it; and the Indian Marine station ships at Port Blair only visit it once a year.

We proceeded to the eastern side of the island, and as we were unable to anchor, the ship was taken in as close as possible, and our party, consisting of the Chief Commissioner (Colonel Anson), Mr. M. V. Portman, a divisional officer, the Chief Commissioner's niece, and two ship's officers, landed in one of the boats. As soon as the party was landed the two members who had guns separated, and in less than half-an-hour each one had obtained five specimens of the birds we required. The Hornbills were plentiful, and were, comparatively speaking, tame as compared with other birds, and many more specimens could have been obtained if we had wished. They only fly a short distance, and make a great noise with their wings when they are flying. The chief peculiarity about the bird is the ribbed furrows on the base of the upper bill or casque. These ridges are not always the same in number, as they vary from two to seven or eight, and probably indicate the age of the birds. The colours of the two male birds which I have presented to the Society's museum are head and neck bright rufous, throat a little paler, tail white, and the rest of the plumage black, glossed with rifle green. The feathers on the breast, abdomen, and the lower tail coverts are however black, and have hardly any of the green gloss which the upper plumage has. The legs and feet are blackish-brown.

The casque is pale horny yellow, darkish red towards the base of the lower bill, and brownish-red towards the base of the upper one, the base of the casque for half-an-inch behind the ridges being dark red. The ridges on the casque are horny yellow, a little brighter in colour than the rest of the bill.

One of the specimens has seven ridges on the casque and the other one six.

Very few other birds were seen or heard during the short space of time we were on shore, but the island seemed to swarm with large lizards (probably belonging to the family *Varanidæ*), some of them being four or even five feet in length, and two specimens were killed for the sake of their skins. They were as tame as pet mice, and one climbed into the lap of the Chief Commissioner's niece and seemed to be quite at home.

After leaving Narcondam we called at the Nicobar Islands, and there obtained some specimens of the curious Nicobar Megapodes (*Megapodius nicobariensis*). This bird is found in most of the islands of the Nicobar group. Its egg is abnormally large for the size of the bird, about six eggs equalling the bird in weight.

The nest of the Megapode consists of a large mound of sand, piled up by one or more pair of birds in the shape of a cone, reaching to 10 feet in height and 25 to 30 feet in circumference. The centre of the mound is composed of leaves and dried roots, amongst which the eggs are laid, and the heat of the leaves when decaying undoubtedly assists incubation. When hatched the young chicks burrow out through the sand in the same way as young turtles do.

One peculiarity of the young Megapodes is that they are fully fledged when hatched, and commence to forage for themselves at once.

We obtained some 40 eggs from different nests, and as many of them were quite fresh we were able to blow them easily. About a dozen eggs were brought on board the ship and carried to Port Blair with the intention of hatching the young birds out. We kept them in some buckets of sand for some time ; but they were forgotten, the sand was taken away, and they lay in the open air exposed even to the rain without any protection. On our arrival at Port Blair the eggs were sent up to the Chief Commissioner's house for the purpose of being blown, but one morning, about three weeks after they had been taken from the nest, one chicken hatched out, the next day another one appeared, and in all five or six were successfully hatched, and when I left Port Blair a few weeks ago, there were four young Megapodes left as healthy and lively as possible. They are fed on white-ants entirely, and seem to flourish on this diet.

J. H. ST. JOHN, LIEUT.,
Commanding R.I.M.S. "Elphinstone."

BOMBAY, *June*, 1898.

No. IV.—A VORACIOUS CENTIPEDE.

A few days ago a toad was found on the gravel path outside the officers' mess with a large orange and black centipede (*Scolopendra gigantea*) coiled round its back. The centipede's head was just behind the toad's fore-leg on the left side, and it had eaten a large hole in the side of the toad. Both were captured and a photograph was taken of them. After a little time the centipede left off eating the toad and apparently went to sleep. Eventually when the centipede was removed the toad was able to hop away in spite of the large hole which had been made in its side.

H. WELLS-COLE, CAPT.,
2nd K. O. Yorkshire Light Infantry.

AHMEDNAGAR, *June*, 1898.

No. V.—WHITE SPOTS ON THE PLUMAGE OF A WOODPECKER ATTACKED BY A PARASITE.

I lately obtained two specimens of *Dendrocopus andamanensis*, the Andaman Pied Woodpecker, and I should like to have an opinion as to what it is that eats into the margins of the secondary feathers in such a peculiar manner. Is it the work of a parasite or is it abrasion ? The curious thing is that it is *always the white spots* on the secondaries which are eaten out. It seems to me to be done by a parasite—some minu e *tinea* which feeds on the plumage of the living bird, though I failed to detect any such in examining the freshly shot birds. Whatever causes it, this ragged condition of the secondary feathers with the white spots cut out is remarkably common in this Woodpecker, in which I have noticed it repeatedly.

I think I recollect having observed the same thing in *Liopicus mahrathensis* and *Tingipicus gymnophthalmus.*

If it is the white spots—which alone appear to be eaten away—that only are subject to the ravages of a parasite, surely natural selection ought to have eliminated them long ago !

A. L. BUTLER.

PERAK, STRAITS SETTLEMENTS, *March*, 1898.

No. VI.—PARASITIC WORMS IN FISH.

In some fish which I recently caught in the Kurram river I noticed that about one per cent contained parasites. At first I could not make out what they were, but seeing them move when separated, I came to the conclusion that they were "parasitic worms." The fish is known here as the "Chilwa" (*Aspidoparia morar*). I should like to know if this fact is of common occurrence, as I have mentioned it to several fishermen, none of whom have ever noticed such a thing before.

I have examined numerous other fish, but find these parasites only in this particular species of fish. On one occasion I opened a fish that had been dead and in the sun for twenty-four hours, and found the parasites were still alive.

R. H. RATTRAY, MAJOR,
22nd Punjab Infantry.

THULL, KURRAM-KOHAT FORCE, *May*, 1898.

No. VII.—NOTES ON WILDFOWL IN THE TINNEVELLY DISTRICT, SOUTH INDIA.

On page 207, Vol. III, of the "Game Birds of India" (Hume and Marshall) there is a note by Mr. Alfred Theobald, made in 1872, *apropos* of the Common Teal, somewhat as follows :—"These Teal are found in great abundance in all the large tanks south of Palamcottah (near Tinnevelly) ; in one especially they were so tame that I mistook them for domesticated ones . . . the only reason I can give to account for these birds being so tame in this district is that hardly a native possesses a gun."

Would it were so now ! The Teal are still with us in considerable numbers, but the race of "pot-hunters" has increased to such an extent, especially in and about Tuticorin, that the ardent sportsman can scarcely bag more than five or six duck and teal in a day, and that with much pain and trouble. I make it worth the while of these native "sportsmen" to bring me their bags daily, whether I buy for the table or not, so that, during the course of the season, I see a considerable number of dead wildfowl in addition to those observed in the not very successful attempts to obtain sport myself. (They apparently do not snare or net wildfowl in this neighbourhood.)

The following are some notes on the prevailing Wildfowl hereabouts :—

The Barred-headed Goose (*Anser indicus*).—This bird appeared last cold weather in considerable numbers, and was with us from November until the end of February. This is a regular cold-weather visitor, but does not always occur in such numbers as last season. I saw one flock of about 50, and five birds were bagged and brought to me in one day by a " pot-hunter."

The Cotton Teal (*Nettopus coromandelianus*).—Fairly common during the cold weather until the end of April, but more so near Tinnevelly (about 30 miles inland) than in this neighbourhood. Probably the inland tanks, smaller and more overgrown with water plants, suit their habits better.

The Whistling Teal (*Dendrocycna javanica*).—Rarer than the preceding, but apparently pretty plentiful in December, January, and February.

The Spotted-billed Duck (*Anas pœcilorhyncha*) occurs in small numbers, but apparently visits us after the cold weather is over. I saw none until March, while two specimens were brought to me on the 12th July this year.

The Pintail Duck (*Dafila acuta*).—By far the commonest duck in the district, remaining with us from November to March in large flocks of 200 to 300.

The Wigeon (*Mareca penelope*).—Fairly common, but not nearly so numerous as the last species. They seem to come later and depart earlier.

The Common Teal (*Nettium crecca*).—Plentiful throughout the district, and remain with us from November until May.

The Garganey Teal (*Querquedula circia*).—Apparently more plentiful in this immediate neighbourhood (Tuticorin) than the Common Teal ; but this may be due to the fact that they consort in larger flocks, and the "pot-hunter" consequently bags more of them. They arrive here about December, and remain until the very end of April and even into May. Two males in full plumage were brought to me on the 26th April this year.

The Common Flamingo (*Phœnicopterus roseus*).—Fairly common throughout the district. One large flock of quite 300 frequented a shallow piece of water, about three miles from here, all the cold weather, and remained until the end of April, when the water dried up. This flock is still (July) in the neighbourhood.

The Banded Crake (*Rallina superciliaris*).—On the 14th November, 1896 after a very severe gale from the N. E. (in fact a cyclone), a bird was brought to me alive, but much exhausted by the wind, which I identified as a male of this species. I allowed it to rest in my garden, and it was sufficiently recovered to fly off the next day. This bird was quite strange to the local shikarries, and I have little doubt was blown over in the gale from the coast of Ceylon, where (*vide* Hume and Marshall) this species arrives in considerable numbers in October.

W. N. FLEMING.

TUTICORIN, *July*, 1898.

No. VIII.—BREEDING OF THE BLACK-BREASTED YELLOW-BACKED SUNBIRD (*ÆTHOPYGA SATURATA*) IN THE CHUTLA BHEEL, CACHAR DISTRICT.

Mr. Primrose *in epistola* says :—" I found a nest of 890 *Æ. saturata*, the Blackbreasted Honeysucker, on the 11th of June, attached to a bamboo, about 3 feet from the ground. It contained two fresh eggs, broadish ovals, of a white colour, freckled all over with greyish-pink or lilac, forming a zone at the thicker end. Female identified and shot off nest."

The nest, which he kindly sent me, is of rather neat construction. It is pear-shaped, and made of what seems to be the black hair-like rootlets, in which are incorporated some dry bamboo leaves and a little moss. Within these rootlets is a lining of fine grass stems. Again, the egg cavity is lined with down. The opening is to the side, and overhung by a cornice which projects 1·4in. above the entrance. In length it is about 8in. ; and the circumference above the cornice is 6½in., that of below the entrance being 9in. Inside the breadth at entrance is 2in. ; and the egg cavity is also 2in. deep. The entrance itself measures 1·2″ × 0·7″ and the cornice 2·7″ × 1·2.″

C. M. INGLIS.

DARBHANGA, TIRHOOT, *July*, 1898.

No. IX.—OCCURRENCE OF THE BLACK-CAPPED KINGFISHER (*HALCYON PILEATA*) AND THE BLACK--LEGGED FALCONET (*MICROHIERAX FRINGILLARIUS*) IN THE CHUTLA BHEEL, CACHAR.

Mr. Primrose, writing from the above district, says:—" I have managed to get, amongst other birds a couple of Black-legged Falconets (*M. fringillarius*) and a Black-capped Purple Kingfisher (*H. pileata*)." The finding of this bird in the above district, which adjoins Hylakandy, tends to confirm my latter opinion, that the bird which I got in Hylakandy, and noticed in my list of birds of that district, [*] *was* that species.

C. M. INGLIS.

DARBHANGA, TIRHOOT, *July*, 1898.

No. X.—NOTE ON THE NIDIFICATION OF THE WHITE-NECKED STORK, (*DISSURA EPISCOPUS*).

On the 22nd of this month I found three nests of this species. They were all three on Simul trees, two of them being on the same tree, on the same branch and *touching* one another. Both trees were close to villages and people were continually passing beneath them. The tree on which the single nest was, I was unable to have climbed, as even after climbing 60 feet by the help of a bamboo, the trunk was too thick for a man's arms to reach round. The other two nests were about 80 feet from the ground. One nest which I had brought down measured on the outside, including the straggling sticks that protruded, 52 inches ; but the nest proper was 29″ × 24″ and 20″ deep at the part that was in the fork, but only 9 inches, at the opposite side. The egg cavity measured 14″ × 13″ and 13″ deep without the lining, which was wholly composed of green Simul leaves to a depth of 6 inches. In one nest were three fresh eggs, measuring 2·49 × 1·84, 2·45 × 1·9, and 2·35 × 1·8 respectively. Though the birds were sitting on both nests, only one nest contained eggs.

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[*] *Vide* the Society's Journal, Vol. XI, page 478.

DARBHANGA, TIRHOOT, *July*, 1898. C. M. INGLIS.

No. XI.—" DOES THE BROWN BEAR HYBERNATE ? "

With reference to Major Rodon's above query on page 547 of the last volume of this journal, I beg to state, that I too, in common with the natives of this district, believe that the Brown Bear (*Ursus arctus*) does hybernate, and my reasons, which may be taken for what they are worth, are the following :—After the sheep have left their summer resorts at altitudes varying from 10,000 to 13,000 feet, it is not by any means uncommon to see " Bhrubboo," as the hillmen call him, feeding on the grassy plains in the mornings and afternoons, and as for his tracks, one comes on them at every turn. Last October I was out after Bears, and in one place found the entire hill-side rooted up in much the same way as if a sounder of pigs had been over it, and, as my shikari sagely remarked, " there is little use of a plough and bullocks here when Brown Bears do all that is necessary." These signs of " Bhrubboo's " presence however are only to be met with till the first week in December, or in the case of a mild winter up to about the 20th of December. If they do not hybernate, surely one would come upon fresh tracks after that date also.

I have spent several winters in the Himalayas, and only last year was up at an elevation of 12,000 feet odd on the 10th of December, and was eventually driven down by a heavy fall of snow. I came upon several fresh tracks during the latter part of November ; but they got scarcer during the first week in December, and after the first fall of snow, which we had, I think, on the 6th of that month, I never saw another sign of " Bhrubboo." I agree with Major Rodon that the villagers have not much opportunity of judging, as they come down to lower altitudes ; but many a hardy shikari takes a periodical trip up during the winter after bhurrel and snow leopard, and they never seem to come across the Brown Bear. From the above facts I am led to believe that the Brown Bear does hybernate ; but it is certainly very strange " why the young in captivity should show no sign of the instinct," as Major Rodon remarks.

C. H. DONALD.

BHADARWA, KASHMIR STATE, *July*, 1898.

No. XII.—HYBERNATION OF THE HIMALAYAN BLACK BEAR, (*URSUS TORQUATUS*).

As many readers of the journal may not know the climate and country round Drosh, it is a pity that Captain Skey, in his interesting note on the Black Bear he found asleep in a tree, did not give some particulars as to whether the country was covered deep in snow, and no apparent food for bears available at the time of year he names ; also what the natives of the country say about the winter sleep of the Black Bear. In Chamba the people living in villages high up, told me that the Black Bear did not sleep through the cold season like the Brown Bear, and that they saw them frequently during the winter ; so when finding a Black Bear asleep during the day at that season, it is necessary to be careful to ascertain that it is not only ordinary sleep the Bear is indulging in.

It has been observed among Marmots, which usually go in for winter sleep, that there is individual differences in hybernation—some individuals sleeping longer and more deeply than others and some not at all—this shows that the cerebral consciousness varies, and that some individuals are more strong-minded than others ; and this may be the same among Black Bears. Although the phenomenon of hybernation has frequently been investigated, its real nature remains unexplained. It cannot be simply due among the Bear family to the lowering of temperatures, as the Polar Bear is seen wandering about during the awful cold of the Arctic winter.

G. S. RODON, Major.

Dharwar, *June*, 1898.

No. XIII.—THE BREEDING OF MOTHS.

Could some member of the Society kindly answer the following questions for me ?

(1) Are moths hermaphroditic ?

(2) If not, is it a usual or common occurrence for eggs laid by a moth that has never had access to a male to be fertile and hatch out ?

Some time back I found a chrysalis, and wishing to see what it would turn into, brought it home and placed it in a wire meat-safe with a net cover. This chrysalis turned into a moth some three weeks ago, and laid eggs in the net during the night. No male could possibly have had access to the female as it was not only in my room but inside the net. Next morning I threw the moth out, leaving the eggs on the net. The day before yesterday I noticed that all the eggs had hatched out, and the young caterpillars were crawling all over the safe. I have frequently seen moths lay eggs without being impregnated by males but I have never seen them hatch out, and always presumed they were unfertile. Would some one interested in, and acquainted with, moths, give me through the journal some information on this point ?

R. H. RATTRAY, Major,
22nd Punjab Infantry.

Thull, Kurram Valley, *May*, 1898.

No. XIV.—NOTES ON A JACKAL CUB.

Some time back a jackal whelp was brought to me for sale. It appeared to be about a month old, and had been captured a short time previously outside a small patch of jungle. As it was fairly tame, and I was anxious to compare its habits with those of an ordinary puppy, I purchased it, and have now had it under constant observation for three months. The following notes regarding it may possibly prove of some general interest. In about a week after "Jacky" had arrived, she became sufficiently tame to be allowed to run about the compound, and from the first she showed the greatest and most untiring delight in play. She would run after a stone when thrown; take it up and race about with it; often bring it back to the point from which it was thrown, drop it, and then race after the next throw. When tired of playing with the same stone or stick, she would roll over it on her back several times, as dogs often do in the case of a dead rat or bad fish: this always appeared to give her a fresh interest in the object, and the game with it would be renewed. "Jacky" soon made friends with a young fox-terrier nearly twice her size, and they enjoyed great games together, constantly racing round and round over open grass, the terrier often being the hunted one. When wishing to show pleasure she smiles and wags her tail, and then often rolls over on her back. She is very clean in her habits, and her coat up to now has no disagreeable smell. Her tail is usually carried low, but when approaching her playfellow (the fox-terrier) slowly, it is often carried high up above the back, and when she sees him coming from a distance, she will constantly crouch down and then bounce up at him as he comes up. In one special habit she differs from dogs, which is she never turns round and round before lying down, as is so common with dogs, and when lying asleep she does so at full length and never curled up. When she first arrived, she, small as she was, often treated me to the well-known jackal yell, especially at night; but after a short time she completely gave up doing this, even when her kindred did so close round about her at night. When wanting food she whines exactly similar to a dog. Her manners at meal-times are not pleasant—bolting her food, and snarling, growling and snapping at all who may approach. She hides a bone by making a hole in soft earth with her nose, and then pushing it in with her nose and covering it over with earth, exactly in the same way as a small dog does. While watching her many and engaging ways, one cannot but be struck with the certainty that her ancestors must have largely contributed in forming the instincts of the domestic dog.

G. S. RODON, MAJOR.

DHARWAR, *May*, 1898.

No. XV.—OCCASIONAL NOTES ON NESTS AND EGGS FOUND IN THE VICINITY OF BARODA.

THE BLACK-THROATED WEAVER BIRD (*Ploceus bengalensis*).—I found these birds breeding near Baroda in August and September of last year. As not much appears to be known about its nidification, I venture to add what little I know. I first noticed these birds in large flocks in the early part of the monsoon ; they were then frequenting large open grass birs on which the grass had not as yet grown to any height. On the 22nd August in company with Professor Littledale and Captain Cox I went out to Ajwa, a large lake some 14 miles distant from Baroda, hoping to get water-birds' eggs. In this we were rather disappointed. However, while paddling up one of the many nullahs which run into this piece of water, we came on the nests of the above bird. The first lot were attached to some rushes or flags growing in water: the others were built on grass along the banks of the nullah. They are typical Weaver Birds' nests. The chief difference appears to me to be that they are not so large as those of *P. baya.* The passage to the egg chamber seemed shorter and that chamber deeper ; further, the nests were attached to several rushes or bits of grass, and consequently are not so neat as those of their cousins.

On the 29th August I found several nests in the grass bir referred to above. In this case they were built on elephant-grass, but in other respects were similar to the first lot. I would add that only two nests, as a rule, were found in one place, apparently one for the use of the male. They were not built in colonies, nor did the birds keep up a cheery chatter like *P. baya.*

Four would appear to be the full complement of eggs, though I got six eggs out of one nest. The eggs are similar to those of *P. baya,* but on the whole, I should say, they are a trifle smaller.

Barnes in his "Birds of Bombay" states that the Bald Coot (*Fulica atra*) breeds in India, as also says Oates in "Hume's Nests and Eggs." I do not doubt the veracity of these gentlemen in the very least. This bird swarms round Baroda in the cold weather, particularly at Ajwa. When I visited this tank, as mentioned above, I hoped to obtain this birds eggs. Imagine my disgust when I found not a single bird on the tank, which is some 10 miles in perimeter. I found the same at every tank I visited, so I feel convinced that they are migratory in Guzerat at any rate.

THE BRISTLED GRASS WARBLER (*Chœtornis locustelloides*).—This bird forced itself on my notice on the same occasion at Ajwa. Oates in editing "Hume's Nests and Eggs" describes the peculiar habit this bird has of "suddenly rising into the air and soaring about, often for a considerable distance, uttering a loud note resembling the words 'chirrup, chirrup-chirrup' repeated all the time the bird is in the air, and then suddenly descending slowly into the grass with outspread wings, much in the style of *Mirafra erythroptera,*"

(p. 253, Vol. I, "Nests and Eggs"). I shot a bird but for some time was unable to identify it; it looked so much like *A. caudata*. I spent some considerable time in watching this bird, but was unable to discover its nest, at which I was much disappointed. I came across the same bird on the 29th August in a large grass bir and sat down to watch it as I was convinced it was breeding. This habit of soaring seemed confined to the male bird. The female seems content to lurk among bushes and high grass. After watching a short time I was more than pleased to observe one of these birds flying towards me with a piece of broad dry grass in her beak. I watched where she settled, and on her departure went to the spot. No nest could I see. I concealed myself in as close proximity as I could and waited. Back she came with more material. On her flying away, I again went to the spot I thought she had risen from but could see nothing. I watched her do this several times. Finally I went away as I could see nothing. I thought it very strange. However, I marked the spot very carefully, and determined to revisit it later. I was able to do this on the 7th September. I walked straight up to the spot, and thought I was doomed to disappointment. Just as I had given up hope, she fluttered up from under my very feet. I looked down, and there was the nest containing five beautifully fresh eggs. It was on the exact spot I had seen the bird rise from, so that she could only just have commenced her nest when I first saw her, which accounts for my not being able to see anything on that occasion. The nest was almost on the ground and was rough and untidy, nearly tumbling to bits when I took it. The outside consisted of broad strips of grass, and it was lined with fine grass, in addition to which it was slightly domed. The grass in which it was situated was from 2 to 3 feet high.

Oates in "Hume's Nests and Eggs" has notes to the effect that the Bronze-winged Jacana (*Metopidius indicus*) lays more than four eggs, though it would appear that this only occurs outside the Bombay Presidency. I took many nests last year with my own hands; in no case did any nest contain more than four incubated eggs. This would appear to be the experience of others in this presidency. It would be interesting to know whether this bird really lays more than four eggs in other localities.

THE CATTLE EGRET (*Bubulcus coromandus*).—Last year I found many of this species breeding without assuming the summer plumage, that is, minus the buff feathers. I saw several birds on their nests. Captain Cox also noticed this. I wonder if any other ornithologists have noticed it.

THE LESSER FLAMINGO (*Phœnicopterus minor*).—In the early part of December my shikari brought in information that some friends of his had discovered a nest some 20 miles away from Baroda. Unfortunately I was unable to go out myself, as I was just then ordered to Bombay on plague duty. The nest was described to Captain Cox, who kindly looked after my interest during my absence, as follows.—"Found at Badalpur on the north bank of the Mahi, at its mouth. No nest; eggs deposited on a mound or small island in brackish water. Another clutch of six existed, but they were taken by muggurs. The bird is described as a large white bird with some feathers of a darker colour on the wings. Said to be very wary, and to leave the nest with a cry like a goose when it sees anybody a mile off." This nest contained four fresh eggs of the size and shape of the Lesser Flamingo, but smooth and firm, not chalky like a Flamingo's. I have shown them to Mr. Oates at the Natural History Museum, South Kensington, who states they may be those of *P. minor*, though, of course, without the bird it cannot be authenticated. I have asked Captain Cox to keep a look-out next year in the same place in case the birds return again. It would be interesting to establish the breeding of this bird in India.

I came on the nest of the WHITE-THROATED MUNIA (*Uroloncha malabarica*) on the rifle range one day. The birds were perched just outside. I put my index finger in to see what eggs there might be, when I received a peck. I withdrew my finger, and on looking in I saw the head of a snake! I immediately inserted a cane, when out he came—a long green beast about 3 feet in length. I was unable to slay him, as he escaped in long grass. In future I shall be careful not to put my finger in a nest till I am sure it has no harmful tenant.

THE RUFOUS FANTAIL-WARBLER (*Cisticola cursitans*).—Although this bird is extensively common round Baroda, I only found one nest containing eggs. Strangely enough it contained six, one of which was perceptibly smaller than the rest. I mention this as in Hume's "Nests and Eggs," five is given as the complement.

R. M. BETHAM, CAPT.,
8th Bombay Infantry.

BARODA, *June*, 1898.

No. XVI.—NOTES ON SPORT IN OUDH.

It is seldom one has the opportunity of observing the behaviour of wild animals in any special circumstances, and an account of the meeting of a bear with tigers may be worthy of record. We were sitting one evening in a *machan* overlooking a wide grassy plain, through which a narrow forest road had been cut, when at sunset a large bear came galloping clumsily through the grass uttering loud grunts after the manner of his kind. On reaching the road, which passed directly under our tree, he stood up to reconnoitre, and almost immediately a tiger appeared on the road some 50 yards lower down. The tiger was carefully stalking the bear, stopping when the latter stopped, and slinking along on his belly when the bear proceeded, so that when the pair reached our tree they were not 10 feet apart. Meanwhile two other tigers came out of the grass and lay on the road, watching events in a lazy fashion. Apparently the bear was unaware of the number of his enemies, but he left the road and secreted himself in a dense patch of dry grass. Thither the tiger followed, but on the bear rushing out with angry roars he turned away strolled up to his kill, and remained there with a bullet through him. The noise of firing sent the bear off into the jungle, and brought the other two tigers to attention. They were too far off for effective shooting and retired uninjured. The family of three were all of one size : the mother was perhaps higher and thinner than the two 4-year old cubs ; the slaughtered one measured 8′ 6″; his permanent canines were just perfect. It is evident therefore that a tiger does not avoid a bear, and that the latter has a great dread of the tiger. Up till now I was of opinion that their policy was based on mutual avoidance. I supplement the list given last year by the measurements of the skulls of four large tigers and a heavy tigress. If tigers of over 10′ 3″ exist in these provinces, I have been unfortunate in not seeing them either dead or alive. The effects of actual perforation of the heart or serious injury to the organ by a bullet may be noted. Four out of the five tigers listed below were so shot, and all of them went 50 to 100 yards before falling dead; there was ample time to do considerable damage, but probably the sense of direction was non-existent, and the animals were practically unconscious. In only one case did a tiger deviate from a straight course in his dying rush ; that one returned in his tracks after going about 50 yards, and fell dead some 20 paces from the shooter. I may be permitted to add my testimony to that of Professor Littledale as to the efficacy of small-bore rifles with smokeless powder. I used a ·303 bore with rifleite, avoiding the arclite cleaning nuisance. For long distance shooting in the open on deer of all kinds this gives great satisfaction ; but as a forest gun for short range shooting at more formidable game it is useless. We lost two tigers hit with soft-nose bullets. They collapsed and then ran away like hares, leaving no blood trail after a few yards. I know of no weapon of less calibre than ·577 which can be relied on to stop a tiger, and that even sometimes fails unaccountably. The following skull measurements are taken between perpendiculars, the tigers being taped as they lay:—

	Length.	Skull.
Tiger	9′ 9″	15″ × 10$\frac{1}{8}$″
„	10′ 0″	15″ × 9$\frac{15}{16}$″
„	10′ 1″	14$\frac{1}{4}$″ × 9$\frac{1}{2}$″
„	10′ 2″	14$\frac{3}{8}$″ × 9$\frac{1}{4}$″
Tigress	8′ 9″	12$\frac{1}{4}$″ × 8$\frac{1}{4}$″

S. EARDLEY-WILMOT.

LUCKNOW, *April*, 1898.

No. XVII.—ELEPHANTS' ANKLE-JOINTS.

Perhaps some of our military members can favour me with an answer to the following received from a friend in the United States, Professor of Biology :—

" As to the elephants' legs and feet, our osteologists say they are badly constructed at the ankle (at least not so well constructed as in the horse, cow,

&c.); and I should like to know if they often have their ankles dislocated, and whether in fact these joints, with bone above bone and rather flat, are unfit for carrying their great weight."

I have answered that, as far as I know, the elephants' ankle-joints are as good as any other beasts, and that I never heard of an elephant with a dislocated ankle. As for the weight, comparatively little is thrown upon this joint.

But I am not well acquainted with elephants, which are scarce in the Bombay Presidency; and should be glad of the comments of members more widely acquainted with them.

I need hardly add that the joint especially in question, is what Mr. Blanford calls "the ankle-joint or heel in the hind leg, corresponding to the hock of other ungulates" ("Fauna of British India," Mammalia, p. 463), the joint, in short, next above the hind foot.

W. F. SINCLAIR (late I.C.S.).

102, CHEYNE WALK, CHELSEA,
LONDON, S.W., *May*, 1898.

No. XVIII.—LION CUBS.

With reference to the information given by Surgeon-Captain Cleveland regarding lion cubs being born with their eyes closed, I very much regret I have not had the great advantage enjoyed by that officer of observing lions in a wild state; and I only based my statement, which appeared in the Journal on the young of the Hunting Leopard that "Lion cubs were born with their eyes open," on what I had read in the lately published book on "Cats" by R. Lydehker; it forms one of the volumes of Allan's Naturalists' Library and is edited by Mr. Bowdler Sharpe, of the British Museum. When describing the characters of the lion at page 28, line 21, he states, "Unlike the majority of the family, lion cubs are born with their eyes open," but after Captain Cleveland's clear evidence to the contrary, I now feel this must be a mistake.

G. S. RODON, MAJOR.

DHARWAR, *June*, 1898.

No. XIX.—THE NESTING OF THE RED-TAILED CHAT (*SAXICOLA CHRYSOPYGIA*).

I have the pleasure to record finding the nest and eggs of the Red-tailed Chat (*Saxicola chrysopygia*), No. 628, Oates, at this place on 2nd June. Thull is a frontier outpost 60 miles from Kohat at the entrance to the Kurram Valley,—elevation about 2,300 feet. The nest was a large, loose, straggling structure in the centre of a dense wild olive bush about 18 inches from the ground. A leaf of the dwarf palm-tree grew through the bush, advantage being taken of the flat surface of the palm-leaf to build the nest on. It was composed of dry grass, straw and rubbish, and filled the entire space round the leaf, about 8″×4″ wide, outside measurements, with a neat deep cup in the centre 2½″×2″, lined with camel hair. It was so loosely made that it fell to pieces on being taken out. Eggs 4, broad blunt ovals, a little pointed at the small ends, with a fair amount of gloss, of a pale greenish-grey, with numerous dark-brown and reddish-brown spots and blotches covering the whole egg; they also have secondary of a light purplish colour under the others. The position of the nest in a bush and the colour of the eggs are not what I expected in a *Saxicola*; but I watched the birds building the nest, and shot the male as it left the nest. I am unable to measure the eggs as I have so little kit here, but they are about the same size as, and something like, highly-coloured large eggs of *Thamnobia cambayensis.* To-day I found two more nests of the bird building, and I will send a clutch of the eggs with the birds for the Society's collection, when I succeed in taking the eggs. The bird is now common here, having appeared some three weeks ago.

I also found on the 1st of June one egg of *Caprimulgus europœus* here, and shot the female bird.

R. H. RATTRAY, Major,
22nd Punjab Infantry.

Thull, Kurram Valley, *May*, 1898.

No. XX.—CURIOUS CONDUCT OF A PANTHER.

On the morning of the 19th instant, on my return from a successful stalk after black buck, my shikaris told me they had marked a large panther into a boulder-covered hill some four hundred yards from my camp. This hill is full of caves and generally holds bears, but since the panther has taken up his abode in the neighbourhood, the bears have shifted quarters to a more congenial spot about three-quarters of a mile away. My Cutch shikari, Ookha Bhil, said it was doubtful whether the beast was a panther or a small tiger, the pugs were so large. So I had a *machan* rigged up, and at 5-30 p.m. went to sit up, accompanied by the above-mentioned shikari. The *machan* was only screened on the side facing the hill; between it and the hill the goat, a beautiful speaker, was tied. There was, however, no time to add more protection to the *machan,* so we sat in a most open position some 12 feet only, off the ground. As the panther was said to be fearless of men, having several times driven intruders away from his kills, and the goat bleated loud and long, I trusted to his coming while there was still light enough to see by. This he would have done, as the black-backed robin was fussing about, betokening that the panther was on the move. However some men came along a track some two hundred paces away to our left and made a great deal of noise, so the panther remained hidden. Just before it got too dark to see anything, I heard a bleat and saw a flash of yellowish-white and the stroke of the right fore leg as the panther felled the goat. No sooner was the goat seized and shaken by the throat than the panther leaped to one side and stood facing the *machan*, looking occasionally at the kill and sometimes up at the *machan*. He appeared however to have no suspicion about it. Then he lay down, still facing us. The light was failing very rapidly, and I could now no longer see any sign of the foresight. The brute remained ten minutes as he was, then got up and, walking slowly round the kill, lay down alongside of it and began sucking the blood. I put some phosphorus on the foresight, took a steady aim at the ground-line, and fired. Up sprang the panther and, leaping sideways, stood broadside on some five paces farther off. I gave him the second barrel, still aiming at the ground-line. To my surprise he turned slowly round, and walked quietly up the hill-side. I thought from the way he carried his head close to the ground that he was badly hit and was about to vomit ; however, it turned out that he was untouched. I waited half an hour and was on the point of telling Ookha to whistle up the other men when he touched my arm and whispered, "Saheb, there is some animal breathing heavily *underneath the machan*." I listened and heard a footfall or two ; then all was silent for a further five minutes, when we distinctly heard the crunching of bones. I could see a shadowy form of sorts, and it was apparently standing broadside on, so I fired ; there was absolutely no movement, only a temporary cessation of the crunching noise, which was almost immediately resumed ; so I fired shot No. 4, this time aiming at the shadowy object and not at the ground-line. A short roar and away he galloped to our left. He went some ten paces, breathing hard and groaning, and fell among a lot of dry teak leaves. He got up again, went some way, and fell again ; then we heard no more. I gave him half an hour's time, and then whistled up the other men. They lit several large fires, and at 8·45 p.m. punctually, or one hour and fifteen minutes after firing the first shot, I descended from the *machan*. We then went to camp. At sunrise on the 20th we went to see the result of the previous night's work. To my delight we found the panther—a heavy, old male with forepaws as large as a tigress, lying dead some eight yards to the left of the *machan*. But had he fallen there? Not a bit of it. He had travelled at least a hundred yards further ; but during the night, a hyæna, following up the blood trail, had found the corpse and dragged it back into the open. This brute, who one would have thought would not have dared go near the carcase of a beast of prey, had devoured the testes and viscera and torn a large piece of the skin off the back. I cannot conceive what made the panther return to the kill, for he was uncommonly fat and well-fed, and had lately killed several calves and goats besides three ponies. Luckily he could not have seen the flash of the rifle ; and the reverberation of the reports must have put him off the right direction of the sound, else he would have had us out of that *machan* in less than no time. The local shikari who built the *machan* got a severe talking to, for on two sides and behind it was entirely unscreened. I may say I was using a double ·577 magnum, by Jeffery, burning 6½ drams—a most accurate weapon by daylight. I used solid soft lead bullets in the righ barrel and hollow brass-tubed ones in the left. It was one of these that finished him, hitting him behind the last rib on the left side and tearing his interior economy to smithereens. Clumsy shooting it is true, though I fired off a rest and was quite cool. One cartridge would have sufficed had I been able to get in a shot while there was still light enough to see the foresight; and the erratic shooting is not in the least attributable to the rifle. I wetted the foresight and rubbed the end of a sulphur match on it; it glowed for about a second, but then went out and left me more bewildered as to where to aim than ever. But that a wary old panther should have returned within half an hour or so to a kill over which he had twice been fired at, and that a hyæna should have dared to go near the carcase of a panther, surprises me. Shot No. 1 (solid bullet) went first over the panther's shoulder as he lay alongside the goat; No. 2 (hollow) struck the ground between his forelegs; of No. 3 (solid) we could find no traces whatever; and No. 4 (hollow) hit as above related. It was lucky it did not hit a bone, but being propelled by 6½ drams, it has a very fair penetration (9 inches into loose sand) before breaking up. Still it was rather risky work on a dark night, and I should have been happier had the solid bullets done their work. I should like to know if any members of the Society have ever had a similar experience?

C. D. LESTER, Lieut.,
17th Bo. Infantry.

Rewa Kantha, *April*, 1898.

No. XXI.—QUERY.

Is any *living* Shark or Dog-fish called "Chagrin," or "Shagreen," or "Sagri, in any living language, and particularly in any Oriental language? Their skins and those of rays, and of horses and asses dressed to imitate them, are so called from Persia to Portugal and further. But I want an instance of the name being applied to the fish itself.

W. F. SINCLAIR (late I.C.S.).

102, Cheyne Walk, Chelsea,
London, S.W., *May*, 1898.

No. XXII.—A BRACE OF TIGERS AT ONE SHOT.

For a really appalling fluke I think the following will be hard to beat:— On July 25th, a Malay, named Said, went into the jungle at a place called Kepong, near Lue, to cut firewood. He took with him an old single-barrel muzzle-loader, which, on the chance of getting a deer, he loaded with a bullet and four buckshot. Moving quietly through the jungle he came suddenly on a tiger feeding on the carcase of a dead sambur. He fired at about 20 paces, and the tiger rolled over. On going up to it he found, to his utter amazement, not one but *two* tigers lying dead within a few feet of each other!

I subsequently superintended the skinning of these tigers, and made a *post-mortem* examination of the bodies. The shot which killed them must indeed have been a marvellously lucky one.

In one case a single buckshot, no larger than a pea, had struck the beast low down behind the shoulder, gone through the centre of the heart, and lodged under the skin on the opposite side. There was no other wound. This was a tigress 7 feet 10 inch in length, fair measurement.

The second tiger was a young male, 7 feet 3 inches in length, and had also been killed by one of these insignificant pellets, which had entered under the elbow, cut through the heart, and passed on down the body. Another slug had struck the animal on the head, but this wound was trifling.

Both beasts had their stomachs full of pieces of the deer's flesh and hair. The tigress had also eaten a quantity of green grass. The Malay's story was told with every appearance of truth; indeed he seemed to see nothing surprising in it at all.

The gods send me such luck if ever I meet a brace of tigers in jungle with nothing but a charge of buckshot!

A. L. BUTLER, F.Z.S.,
Selangor State Museum.

KUALA LUMPOR,
FEDERATED MALAY STATES, *July*, 1898.

No. XXIII.—MIGRATION OF *EUPLŒA CORE*.

I daresay other members of the Society, as well as myself, noticed the remarkable migration of *Euplœa core* over Bombay on the 26th and 27th of last month. I noticed it first about 4 o'clock on the former date; it was resumed early on the following morning, and continued till the afternoon at least. The habit which this butterfly has of migrating northwards annually about the first week of June has been noticed before in our journal, and I have observed it for many years past; but this movement in a contrary direction two months later is a new thing to me and is very interesting. I do not think that *E. core* is a long-lived butterfly, and it is very unlikely that the individuals which came from the north last week were the same as those which passed in the opposite direction last June. More probably they were the first offspring of the latter just emerged. Allowing four or five days for the eggs to hatch, and about three weeks for the larva to grow to maturity, and ten days more for the pupa state, or about forty days for the whole, which I believe is a good average estimate, and supposing that those which went northward laid their eggs about the 10th of June, the next generation of butterfies would begin to appear about the 20th of July, which fits the facts very well. I am inclined to think that the object of the northward journey is simply to escape the very heavy rain with which the monsoon opens on the Southern Coast; but I have always been puzzled to imagine what became of those that went north, and how the population of the south was kept up. This return to the south about Cocoanut Day explains all, for, though I never observed it before, I have no doubt it is an annual event.

E. H. AITKEN.

URAN, *August*, 1898.

PROCEEDINGS

OF THE MEETING HELD ON THE 14TH JUNE 1898.

A meeting of the members took place on Tuesday, the 14th June 1898, when Lieutenant-Colonel H. D. Olivier, R.E., presided.

NEW MEMBERS.

The election of the following new members was announced :—Mr. W. R. Williams (Roorkee); Mr. R. H. Harter (Bombay); Mrs. Arthur Jacob (Mhow); Mean Saheb Bhurie Singh (Chamba); Mr. F. A. Tydd (Cachar); Surgeon-Captain C. J. Milne, I.M.S. (Baklob); Lieutenant A. E. Sealy (Bakloh); Mr. William Trotter (Jalpaiguri); Mr. C. Donald (Wazirabad); Dr. W. Forsyth (Calcutta); Lieutenant C. J. Kendall, R.I.M. (Commanding R. I. M. S. Lawrence); Mr. E. L. Winter, I.C.S. (Saharanpore); Mr. Edward O'Brien (Amreli); Mr. R. C. J. Radcliffe (Hyderabad, Sind); Surgeon-Major J. Watson, M.D. (Agra); Mr. G. C. B. Sterling (Upper Burma); Mr. G. St. C. Lightfoot (Upper Burma); Mr. E. L. Sale, I.C.S. (Poona); Mr. A. St. Vincent Beechey (Sambalpore, C. P.); Surgeon-Captain C. E. Pollock, I. M. S. (Ranikhet); Mr. P. Duncan, M.I.C.E. (Bezwada); Captain K. J. Buchanan (Changla Gali); Mr. Alexander M. Primrose (Cachar); Miss (Dr.) C. F. Ferreira, L.M. & S. (Bombay); Mr. W. A. Benson (Khandeish); and Lieutenant J. H. St. John, R.I.M. (Commanding R. I. M. S. Elphinstone).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged receipt of the following contributions to the Society's museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Crested Serpent Eagle	*Spilornis cheela*	Capt. P. Z. Cox.
Some Shells, &c., from the Seychelles Islands.	......	Dr. Sinclair.
1 Screech Owl (alive)	*Strix javanica*	Mr. R. Maidment.
Chukor Partridges (alive)	*Caccabis chukor*	Mrs. Waghorn.
1 Panther Cub (alive)	*Felis Pardus*	Mr. R. P. Barrow, I.C.S.
1 Checquered Water Snake	*Tropidonotus Piscator*	Surg.-Capt. Hojel.
1 Skin of the Painted Spur Fowl.	*Galloperdix lunulatus*	Mr. R. Roberts.
1 Cape Viper	*Canous rhombeatus*	Mr. Queckett.
A number of Shells from South Africa.	......	Lieut. N. F. Wilson, R.I.M.
3 Skins of the Narcondam Hornbill.	*Rhytidoceros narcondami* ...	Lieut. Commdr. J. St. John, R.I.M.
1 Snake	*Polyodontophis subpunctatus*	Mr. W. F. Biscoe.
1 Large Python's Skin	*Python reticulatus*	Mr. H. Tilley.
Skins of the large Malay Squirrel, Pallas's Squirrel, and the Indian Marten.	*Sciurus bicolor, Sciurus erythræus, Mustela flavigula.*	Do.
Nest and young of the Madras Rufous Woodpecker.	*Muscropternus gularis*	Lieut. N. F. Wilson, R.I.M.
1 Red-headed Merlin (alive).	*Æsalon chiquera*	Mr. J. P. Brand.
1 Panther's Skull	*Felis Pardus*	Mr. F. Gleadowe.
Eggs of the larger Racket-tailed Drongo.	*Dissemurus Paradiseus*	Mr. Patten.
Skins of the Bonelli's Eagle, Red-headed Merlin, Brahminy Kite, Indian Koel and Painted Snipe.	*Hieratus fasciatus, Æsalor chiequira, Haliaster indus, Eudynames honorata, Rhynchæa caensls.*	Mr. C. Donald.
Pied-crested Cuckoos (alive).	*Coccystes jacobinus*	Mrs. W. George.
A number of Shells from the Andaman and Nicobar Islands.	......	Lieut. Commdr. J. St. John, R.I.M.
2 Andaman Teal	*Nettium albigulare*	Major H. Graham.

MINOR CONTRIBUTIONS RECEIVED FROM

Mr. L. Morgan, Dr. E. H. Brown, Mr. J. A. Betham, Mr. P. Newnham, Mr. A. Leslie, Mr. W. Gaye, Miss George, Mrs. Acklom, Mr. A. J. Taylor, Mr. H. Bulkley, and Surgeon-Major R. H. Nicholson, A.M.S.

CONTRIBUTIONS TO THE LIBRARY.

Game Birds of India (Oates), Vol. I, from the Author ; Memoirs of the Geological Survey of India, Himalayan Fossils, Vol. I., Part 3, from the Government of India ; Mitteilungen aus der Zoologischen Sammlung des Museums für Maturkunde in Berlin, in exchange ; Nature, Vol. 57, Nos. 1,479—1,488, Vol. 58, Nos. 1,488 and 1,490, from Mr. W. F. Sinclair;

The Irish Naturalist, Vol. VII, Nos. 3, 4, and 5, from Mr. W. F. Sinclair ; The Transactions of the Entomological Society of London for 1897, in exchange ; The Indian Forester, Vol. XXIV, Nos. 3, 4, and 5 ; The Canadian Entomologist, Vol. XXX, Nos. 3, 4, and 5 ; Fauna of British India, Vol. IV, Birds (Blanford), from the Author ; Journal of the Marine Biological Association, Vol. V, No. 2, from Mr. W. F. Sinclair ; The Embryology of Crepidula ; The Avicultural Magazine, Vol. IV, No. 42 ; Bulletin de la Societé Zoologique de France, Tome XXII, Nos. 1 to 9 ; Memoires de la Societè Zoologique de France, Année X, Nos. 1 to 4 ; Annali del Museo Civico di Storia Naturale di Geneva, Vol. XVIII ; The Agricultural Ledger, Nos. 18 to 20 ; Proceedings of the California Academy of Science, Third Series, Zoology, Vol. I, No. 4; Proceedings of the California Academy of Science, Third Series, Geology, Vol. I, No. 2 ; Proceedings of the Academy of Natural Sciences of Philadelphia, Part II, 1897 ; The Reptiles of the Pacific Coast and Great Basin (I Van Denbourgh) ; Annals of the Royal Botanic Gardens, Calcutta, Vol. VIII, Parts 1 to 4 ; Journal of the Asiatic Society of Bengal, Vol. LXVI, Part II. No. 4 ; Report of the Provincial Museum of the N.-W.P. and Oudh for 1894-96 ; Perak Museum Notes, Vol. II, Part 2 ; Proceedings of the Nova Scotian Institute of Science, Vol. IX, Part 3 ; Report of the Entomological Society of Ontario for 1897.

PAPERS READ.

The following papers were then read and discussed :—

1. Description of six new species of scorpions from India, by R. I. Pocock (British Museum of Natural History).
2. A Monograph of the Pill-Millipedes inhabiting India, Ceylon, and Burma, by R. I. Pocock.
3. On the zoological division of Sikkim, by H. J. Elwes, F.R.S.
4. Species of Western Peninsular trees, shrubs, &c., from North Kanara, by W. A. Talbot.
5. Some cases of caudal abnormality in *Mabuia carinata* and other lizards by H. H. Brindley, M.A.
6. On new and little known Butterflies from the Indo-Malayan, Austro-Malayan and Australian regions, by L. de Nicévillé, F.E.S.
7. Description of a new species of *Mus* from S. India, by J. L. Bonhote (British Museum of Natural History).
8. On *Afridia*, a new genus of Labiatæ from the N.-W. Frontier of India, by J. F. Duthie, F.L.S.

MISCELLANEOUS NOTES.

(*a*) The Baira Antelope, by Captain P. Z. Cox.

(*b*) Bahmeen fishing in Bombay Harbour, by E. L. Barton.

(*c*) A Panther with twenty toes, by S. Eardley-Wilmot.

(*d*) Note on two specimens of *Hypsirhina sieboldii*, by Surgeon-Captain F. Wall, I.M.S.

(*e*) Distribution of the Slender Loris, by A. M. Kinloch.

(*f*) Nesting of the Malabar Rufous Woodpecker, by Lieutenant N. F. T Wilson, R.I.M.

(*g*) Panthers and their ways, by W. A. Wallinger.

(*h*) Reasoning power in Bees, by S. Eardley-Wilmot.

(*i*) Notes on a Jackal cub, by Major G. S. Rodon.

(*j*) The young of the Hunting Leopard, by Surgeon- Captain H. F Cleveland, I.M.S.

(*k*) Hybernating of Indian Bears, by Captain F. E. G. Skey, R.E.

(*l*) Protective power of scent in animals, by S. Eardley-Wilmot.

(*m*) Nidification of the Indian Lorikeets, by A. L. Butler.

(*n*) The Narcondam Hornbill, by Lieutenant J. H. St. John, R.I.M.

EXHIBITS.

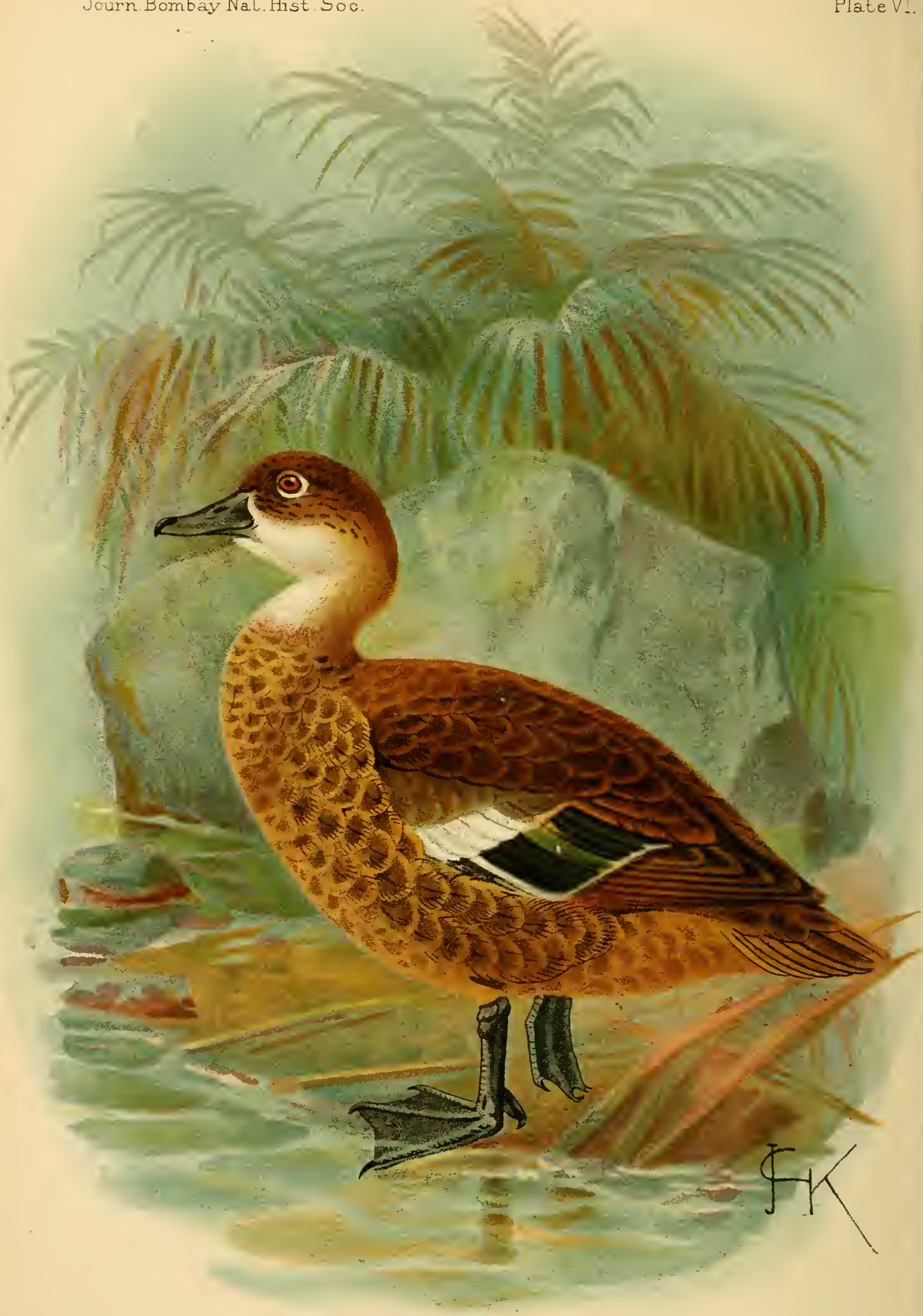
Lieutenant N. F. T. Wilson, R.I.M, exhibited the nest of the Madras Rufous Woodpecker found at Tanna, from which he had taken the young bird. When found, the nest was swarming with the small black ants to whom it properly belonged, thus conclusively proving that the bird does not wait for the original occupants to vacate the nest before laying her eggs in it.

Mr. F. Gleadow, I.F.S., exhibited the skull of a panther shot last year at about 8,000 feet in the hills north of Chakrata. The skull has a large cavity on one side and a projection on the other side. which are apparently the results of an old wound, and may possibly have been caused by a bullet glancing off the top of the skull.

Lieutenant J. H. St. John, R.I.M., exhibited a number of beautiful shells which he had brought up for the Society from the Andaman and Nicobar Islands, and also several skins of the rare Narcondam Hornbill (*Rhytidoceros narcondami*) which he had obtained for the Society from the small Island of Narcondam, where these birds are only known to occur. The only previous specimens recorded are a pair which were obtained by Hume as far back as 1873, so that these specimens are a valuable addition to the Society's collection.

Captain F. E. G Skey, R.E., exhibited some photographs illustrating the great extremes in the shape of the Markhor horns obtained near Drosh, some being quite a straight spiral (Cabul variety), whilst others *in the same herd* had the wide spread of the Pir-Panjal variety (Blanford).

A vote of thanks was passed to the members who had contributed papers, &c., and the meeting then terminated.



J. G. Keulemans del.

Mintern Bros Chromo lith London.

THE OCEANIC TEAL.

Nettion albigulare.

⅖ Nat size.

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JOURNAL
OF THE
BOMBAY
Natural History Society.

Vol. XII. BOMBAY. No. 2.

INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F.Z. S.

Part VI, with Plate VI.

(*Continued from p. 31 of Vol. XII.*)

Genus MARECA.

The genus *Mareca* differs principally from *Nettion* in having a smaller bill, which is distinctly narrower and rather tapering towards the tip; from *Chaulelasmus* it differs in not having the camillæ of the upper mandible so prominent, and the tail feathers are more pointed, the central rectrices extending beyond the others.

There are only three species in the genus, of which but one, *M. penelope*, reaches our limits; of the other two, one, *M. americana*, is a North American form, whilst the other, *M. sibilitris*, is a South American bird. All three are much the same in size.

23. Mareca penelope.

The Wigeon.

Mareca penelope, Jerdon, "Birds of India," III, p. 804; Hume, "Str. Feath.," I, p. 271; Butler, *ibid*, IV, p. 30; Hume, *ibid*, *id.*, *ibid*, VII, p. 494; Davis and Wendon, *ibid*, p. 93; Scully, *ibid*, VIII, p. 63; Hume, Cat., No. 963; Hume and Marshall, "Game Birds of India," III, p. 197; Vidal, "Str. Feath.," IX, p. 92; Butler, *ibid*, p. 438; Reid, *ibid*, X, p. 82; Hume, *ibid*, p. 245; Davidson, *ibid*,

p. 326; Oates, "Birds of British Burmah," II, p. 278; Barnes, "Birds of Bombay," p. 408; Hume, "Str. Feath.," XI, p. 345; Salvadori, British Museum Cat., XXVII, p. 227; Blanford, "Birds of India," IV, p. 445.

Description: Adult Male.—Forehead, crown and anterior nape pale buff, sometimes with a few black dots on the nape, remainder of head and neck dull chestnut, much speckled anteriorly with black, and the chin and throat more or less black also; back, sides of neck and upper breast, flanks, scapulars, rump and shorter upper tail coverts vermiculated blackish-brown and white, the rump and upper tail coverts with the white predominating, longer upper tail coverts black; central rectrices brownish-black getting paler on the each succeeding pair, the outer pairs being also tipped white; upper breast and lower neck and sides of lower breast vinous-red, under tail coverts black, rest of lower plumage white; smallest wing coverts greyish-brown, more or less vermiculated white, primary coverts vinous-grey, remaining coverts white, the greater secondary coverts tipped black, primaries brown, pale-shafted except at the tips; outermost secondaries brilliant metallic green, broadly edged and tipped black; outer web of next secondary pure white, edged black; inner secondaries black, edged white and greyish on the inner webs.

"Irides deep red-brown; bill grey-blue, livid blue, or bluish-plumbeous, the tip black; legs dusky lead, lead-grey or, rarely, greenish-lead colour, dusky on the joints and webs, and with the claws dark.

"*Males (adults).*—Length 19·0″ to 19·5″; expanse 32·75″ to 34·5″; wing 10″ to 10·5″; tail from vent 4·0″ to 4·6″; tarsus 1·4″ to 1·6″; bill from gape, 1·7″ to 1·82″; weight 1lb. 5oz. to 1lb. 10oz." (Hume).

During the early part of the cold weather the feathers of the breast have grey edges which make the whole breast a pale greyish-vinous, as the season progresses the edges wear off and the breast gets richer in colour in consequence.

Adult Female.—Head and neck pale reddish-brown, richer posteriorly and paler below, speckled with very dark brown; rest of plumage above brown with pale edges to the feathers varying from almost white to rufous, the scapulars and interscapulars more or less barred with the same; smaller wing coverts like the back, median the same but with broader edges, greater coverts with still broader paler edges, quills plain brown, a dull blackish-brown speculum edged by the outer secondaries more or less tipped white, and with the secondary next the speculum having the outer web broadly white. Innermost secondaries edged with fulvous. Lower neck and breast reddish-brown, sometimes speckled with darker; lower breast, abdomen and vent varying from white to uniform pale, rather bright rufous-buff, the flanks and axillaries darker and often more or less spotted brown. Under-tail coverts the same as the abdomen but with the feathers centred dark.

Bill slaty-blue, nail black, the base of the maxilla often darker, the mandible with the commissure, base and often the tip darker and nearly black. Irides from light dull to deep bright brown; legs grey or drab marked with dusky as in the male.

"Length 17·8″ to 19·25″; expanse 31·5″ to 34·0″; wing 9·3″ to 10·2″; tail from vent 3·5″ to 5″; tarsus 1·4″ to 1·6″; bill from gape 1·68″ to 1·8″; weight 1lb. 3oz. to 1lb. 10oz. (Note that only one female out of 27 weighed more than 1lb. 9oz.)" (Hume).

Young Male.—Much like the female, but the upper parts, especially on the rump and upper tail coverts, more grey than brown, and soon assuming the vermiculated appearance of the adult male; white about the speculum far more developed, as is the speculum itself, and the breast and fore neck are a richer brown.

Male in the first nuptial state or changing from the young into adult stage.—Head rich brown, boldly spotted with black, less so below upper back and adjoining parts as in the female but gradually changing to grey on the lower back and rump, where it is beautifully vermiculated and stippled with white; upper tail coverts, scapulars and innermost secondaries like the upper back, wing like the adult male but the speculum inconspicuous; lower parts as in the female but with the breast a very rich rufous contrasting both with fore neck and abdomen.

Nestling.—"May be distinguished by the warm rufous tint of the cheeks and throat and the absence of any loral streak; the upper parts are, moreover, of an almost uniform brown, with hardly any signs of bars on the pinions" (Yarrell).

The Wigeon is found throughout Europe at different seasons, being a permanent resident in some of the northern countries; practically throughout Asia, though rare to the East. Breeding in the North and wintering South; in Northern Africa in the cold weather as far South as Abyssinia, Southern Egypt and to Madeira. It also wanders as far as North-Eastern America.

Within our limits it is found practically everywhere except in the extreme South and in Ceylon. It is decidedly common in Cachar and Sylhet to my own knowledge, not rare in Goalpara and Kamrup, in which districts I have shot it, and is found throughout the province of Assam, whilst in Burma it has been recorded from N. Tenasserim. It will be noticed that in certain localities one person records this teal as being very plentiful, whilst another, who may be equally good an observer and naturalist, says it is never found. This is due to the fact that the Wigeon is most irregular in its visits, and whilst it comes one year in hundreds and even thousands to certain parts, yet these localities may be hunted in vain the following season for a single specimen.

Notes recorded by various ornithologists and sportsmen would seem to shew that in years of heavy rainfall the Wigeon does not visit India in the same numbers as it does in drier years.

Thus Reid writes of Oudh : "The Wigeon is by no means uncommon, though it is, I think, rather erratic, in its wanderings, being much more common in some seasons than in others. During the past cold weather, for instance, when the jhils were much below their average size and many of the smaller ones altogether dry, I did not expect to meet with it ; but as a matter of fact, it was much more common than I had ever known it to be before."

Again Vidal : " Wigeon in some years are very abundant on the Vashishti River, congregating in large flocks of five hundred birds or more, but they are not like Common Teal, widely distributed. In 1878-79, after the highest rainfall on record, not a Wigeon was to be found in the district ; but in 1879-80 after a year of moderate rainfall, they reappeared in their usual strength on the Vashishti."

Davidson notes it as rare in Mysore, but Major McInroy says that a fair number may be met with in parts. The only way I can at all account for the Wigeon being more common in dry than in wet seasons is because it is very much of a shallow water or bottom feeder. In very wet seasons the lakes, jhils, ponds, etc., all overflow their normal limits, and thus the edges and the shallow water covers ground on which no water weeds grow and on which the natural dry land vegetation has been killed by the water. On the other hand, in dry seasons the water recedes and much jhil vegetation, which, under ordinary circumstances would be in a few feet of water, is within a few inches of the top and well within grasp of the teal as it feeds with only its tail-end out of water. They are of course strong and expert divers, but do not feed, I think, on any stuff which necessitates their going completely under water. Of two birds shot in Silchar the stomachs contained nothing but the white tendril-like roots of a small water plant which grows profusely when the water is only a few inches deep, and these the birds could obtain by merely standing on their heads, as it were, in the water. They graze a good deal like geese on young grass and also young crops, and in addition to various other vegetable substances eat water-snails, worms, insects and shell-fish of sorts, this more particularly near the sea coast, where they are often found in brackish estuaries or back waters."

Morris writes: " This species feeds principally on water insects and their larvæ, small mollusca, worms, the fry of fish, and frogs ; as also the buds, shoots, and leaves of plants and grass ; and these it browses on in the day time, but it chiefly seeks its food in the mornings and evenings, and also at times in the night."

All ducks it should be noted, whether as a rule day or night feeders, are inclined to feed freely during moonlight nights, and this is perhaps more especially the case with such as graze on grass and young crops. I never myself obtained a single specimen in the Sunderbands, but have often been assured that they are common there. Hume says that they are as quick in rising as is the Gadwall. I should have given the palm to the Gadwall for quickness in getting off the water, but once up, the Wigeon is quite as fast in getting away. On the wing they are certainly not as fast as either the Gargany or Common Teal, nor are they as hard to bring down, for they are less densely plumaged and can carry far less lead.

They vary very much in being wild or the reverse, but taking them everywhere, in comparison with other ducks, they may be said to be cute, wary birds, but falling short in this respect of many of their kind. What adds, too, to the ease in obtaining shots at them is their habit of feeding almost throughout the day, their feeding taking them much to the edges of the jhils and lakes where they remain amongst the reeds and vegetation. This, of course, hides the stalker and the stalked, and many shots may be obtained at Wigeon by walking round the borders of a lake whilst most of the other duck are away in the middle of the water, unapproachable except by a boat and often not by that. They collect in very large flocks, sometimes numbering as much as seven or eight hundred individuals, but more often will be found in flocks of a hundred or so, and, of course, when they are less common in small flocks of a dozen or less, often in pairs or singly, but in the latter case always with some other duck.

Of their voice Hume writes : "They are on the whole, neither loquacious birds, and both when feeding and at rest, when walking, swimming and flying often utter a shrill 'whew, ' a sort of whistle by which you may know them at any distance ; it is not a clear full whistle like the Curlews, but a whistled cry rather discordant when heard by day, but not without its charm when uttered by night by large numbers mingled with the call of many other species and mellowed by the distance and the multitudinous voices of winds and water."

They fly with a swift powerful flight, generally in line formation, the line nearly always irregular and altering much in shape as the birds fly ; the two ends are generally thin, whilst towards the centre the birds are more numerous. When flying from one jhil to another or when put up by shots they do not, I think, take any particular formation.

Meyer says : "The Wigeon fly in the usual manner of ducks following one another ; but these birds fly so very close upon the heels of their leader that it formed a distinguishing peculiarity."

Hume notes the peculiar rustle made by the Wigeon in flying ; this is very distinctive, and when close at hand sounds very different to the swish of the Mallard or the sound of other ducks' flight.

In England they are caught in large numbers by decoys which induce the wild birds to enter small waterways which are roofed in with wire netting and which gradually lead to a large drop-net in which they are entangled. The placing of the pipes, as the leading tunnel-nets are called, is the main feature of the trap, as these have to be so made that they are quite inconspicuous and the entrances must be natural ones. Sometimes a small dog is trained to dodge about the pipes, continually showing itself higher up the pipe for an instant or two and attracting the curiosity which is a strong trait in all ducks.

In Goldsmith's "Natural History," a little volume dated 1830, it is said that: "In only ten decoys in the neighbourhood of Wainfleet, so many as thirty-one thousand two hundred have been caught in a season." This, of course, refers to all kinds of ducks, not to Wigeons only.

To eat, the Wigeon is sometimes first rate, sometimes decidedly fishy and rank. At home it is considered quite one of the higher class of ducks for eating, but out in India it is often *not* of a higher class; Hume says of some he got on the sea coast that they had such a distinct "odour of brine from the ocean" about them that they were quite unpalatable. Those shot in Cachar I have always found very good indeed.

The Wigeon breeds throughout the greater part of its Northern habitat, but probably nowhere within the Arctic Circle. It is common in Iceland and still more so in Lapland, breeds throughout Northern Europe and also, I am told, in East Prussia, and it also breeds in North-West Asia, less commonly to the East. In Great Britain it has often been found breeding in Scotland and also in Ireland, and just lately Mr. W. J. Clarke recorded the finding of a Wigeon's nest in Yorkshire, this being the first record of its breeding within the limits of England itself.

Its nest may be placed either close to water, in amongst the growth on the banks or shores, or it is sometimes placed a good distance from it. In Scotland it is frequently found well hidden in amongst heather well away from the nearest water. As a rule, it is very well hidden, but at other times is very conspicuous and can be seen from a few yards away. The duck sits very close indeed, and flying up at one's feet usually shows the whereabouts of the nest, however well it may be hidden. The drake would seem to take little interest in the nest or eggs, and leaves the duck not only to do all the incubation, but also to look after the young until they are some days old.

The nest would appear to differ from other ducks' nests in being better put together in most cases. In some nests the materials, moss, leaves, grasses, and weeds are well intermingled and interwoven with one another and with down, which not only forms the lining but is also incorporated in the body of the nest itself. Frequently on the other hand the nest is very primitive and consists of only a few of the materials mentioned, just loosely placed in some hollow in the ground.

Dresser, as quoted by Hume, says: "The eggs are deposited late in May or early in June, the locality selected for the purpose of nidification being sometimes close to the water's edge and at others some distance from it; for Mr. Colley informs me that he found a nest on the fells, not far from the town of Lillehammer, which was under a juniper bush, at least 800 yards from the water. The nest is a mere depression or hole scratched in the ground and well lined with down and a few feathers, intermixed with a little moss or a few grass bents. A nest which I possess consists of a little moss matted together with down, the latter being of a dark sooty brown colour, the centre of the down being rather lighter or a dark sooty grey, and a few feathers of the bird are interspersed here and there."

"The eggs are creamy white in colour and oval in shape, tapering slightly towards the smaller end."

In rather strong contrast to the above "mere depression or hole" is Mr. Wolley's description of a Wigeon's nest: "A nest is an extremely pretty sight, even when separated from its native bank and all the accompaniments of flowers, roots, moss and lichen."

The number of eggs is normally six to eight or sometimes ten. Morris says five to eight, Meyer ten to twelve. In colour they vary from a pale cream so faint as to appear white to a rather warm cream or buff, generally the former. Hume's eggs measured 2·1″ to 2·3″ in length and 1·5″ to 1·6″ in breadth. The texture is, of course, fine and fairly close, with the surface inclined to be glossy. Incubation is said to last about 24 days.

Two eggs in my own collection, which come from Lapland, are smaller than any of Hume's, measuring 2·05″ × 1·5″ and 2·00″ × 1·45″. Both these eggs are also unusually glossy.

Genus NETTION.

The genus *Nettium* or *Nettion* is one of the largest in the order *Chenomorphæ*. As restricted by Salvadori, there are seventeen species contained in it, of which three only are found in India. The range of the genus is cosmopolitan, and it contains species both resident and migratory, both of which are represented in India.

The differences between *Nettion* and *Anas*, *Chaulelasmus* and *Mareca* have been already pointed out.

Key to the Species.

Speculum, secondaries bronze-green at base, then black and tipped white, and with their coverts tipped rufous ... ... (1) N. FORMOSUM.

Speculum. Outermost secondaries black with white tips, those next them brilliant metal-green, next again to them one black, the remainder like back ... ... (2) N. CRECCA.

Speculum. Outer secondaries black except two or three in the centre, 7″ to 9″ which are bronze-green ... ... (3) N. ALBIGULARE.

24. NETTION FORMOSUM.

The Baikal or Clucking Teal.

Querquedula glocitans, Jerdon, "Birds of India," III, p. 808; Hume, "Str. Feath," VIII, p. 412.

Querquedula formosa, Hume, "Str. Feath.," VII, p. 494; *id.*, VIII, pp. 115, 494; *id.*, Cat., No. 960; Hume and Marshall, "Game Birds," III, p. 225; Barnes, "Birds of Bombay," p. 411.

Nettion formosum, Blanford, "Birds of India," IV, p. 442.

Description: *Adult Male.*—"Crown of the head, back of the neck, entire throat, and a band extending from the eye across the face to the throat, black; face and neck on the sides and under the throat buff, the buff parts narrowly margined with white; also the black crown from behind the eye is bordered on each side with a white band, which runs down the sides of the black nape, and spreads on the sides of the neck; from behind the eye a broad glossy green band, of a crescentic shape, passes along the sides of the head and inferiorly changes into black, between the buff colour anteriorly and white band posteriorly; back and scapulars grey, somewhat tinged with brown, minutely vermiculated with black, the inner scapulars elongated lanceolate, on the outer web black, edged with cinnamon, silky buff, edged with brown on the inner web; lower back and rump greyish-brown; the upper tail coverts brown, edged with rufous; lower neck and upper breast vinous, marked with small oval black spots; on the sides of the breast, just before the bend of the wing, a crescentic white band; lower breast and belly white; flanks grey, minutely vermiculated with black; under tail coverts black, but marked with bay on the sides, the longer ones whitish-buff at the tips, with slight vermiculations on the lower flanks, just at the base of the tail a band of silky white, formed by the tip of the feathers; wings pale greyish-brown; the last row of the upper wing coverts tipped with cinnamon, forming a band which borders anteriorly the wing speculum; the latter is glossy green anteriorly with a sub-apical velvety black band, and bordered by a white band at the tip of the secondaries; the longer tertiaries marked with velvety black on the outer webs; quills pale brown; under wing coverts brown-grey; the greater ones pale grey, the centre ones and axillaries whitish, minutely spotted with brown-grey; bill dark bluish-brown; feet light greyish-blue, darker on the web; irides chestnut brown. Total length 18 inches, wing 8·5″, tail 4·2″, culmen 1·5″, tarsus 1″" (Salvadori).

"Length 15·8″; wing 8·15″; tail 3·9″; tarsus 1·3″; bill at front 1·5″; from gape, 1·92″" (Hume).

"The tarsus . . . in a fine male from China is 1·4″" (Hume).

Again Temmenck and Schlegel give the dimensions of the tarsus as 1·28″.

Of the four specimens in the Indian Museum, Calcutta, the measurements of the tarsus of the males are 1·2″ to 1·3″; the measurements were kindly supplied to me by Mr. F. Finn.

Female.—" Upper parts, wings and tail brown, with paler edges to the feathers; crown darkest; speculum as in the male, but the rufous and bronze-green bands duller; a buff spot on each side of the head in front of the lores; another under each eye; sides of the head and neck buff or pale rufous, speckled with brown; lower parts white, except lower fore neck and upper breast, which are light rufous-brown with dark spots."

"Length 15·0″; culmen 1·45″; wing 7·8″; tail 3·5″; tarsus 0·9″" (Dresser).

"The only female in the Indian Museum, Calcutta, has a tarsus measuring 1·3″" (Hume).

"The male assumes, after breeding, a plumage very similar to that of the female, from which he is only to be distinguished by the darker brownish-red tint of the upper breast, and the comparatively uniform colour of the upper back, the feathers of which, in the female, are darker and very conspicuously bordered with reddish-buff." (Hume).

Roughly speaking, the habitat of the Clucking Teal may be said to be the Eastern portion of Asia, south of the 70th degree, north latitude, and east of longitude 80°. To the south its boundary may be taken as the 20th degree latitude. It is extremely common in many parts of Southern China, Central East China, Formosa and the South of Japan in the winter, but it has at no time been reported from Yezzo, or elsewhere to the North of Japan. The extreme North of China, Mongolia, Manchuria, and perhaps Corea, it seems only to visit on migration, its summer home being Northern Asiatic Russia and Siberia.

Salvadori says that it straggles into the "Western Palæarctic region (Italy and France)," and again in Latham's "General Synopsis of Birds" (1780), I find the following under the heading of *Anas glocitans* :—"Taken in a decoy in England. Has also been met with along the Lena and about the lake Baikal. Has a singular note somewhat like clucking."

Within Indian limits its occurrence has been of the rarest and can be counted on one's fingers. Blyth got a male in the Calcutta bazaar. Col. McMaster says that he believed that he got what was a specimen of this species in the Upper Circars. Mr. E. James had a painting of the head of a teal, said to have been shot in Sind, which was undoubtedly—the painting—that of this species. In November, 1879, Mr. Chill got a male Clucking Teal about 30 miles south of Delhi ; this he preserved and sent to Hume. Thus up to Hume's time the records of its actual occurrence are but two in number and of its possible occurrence two more.

On 16th December, 1898, Mr. E. L. Barton, of Bombay, shot a male Clucking Teal about 20 miles from Ahmedabad, in Guzerat.

Information of this duck's habits is meagre in the extreme, and I can find practically nothing of interest.

Its flight is said to be swift and teal-like, but instead of, like the Common Teal, flying at great heights when on migration, they fly low and close to the surface of the country. This habit of flight, however, is probably only a distinctive feature as the Clucking Teal approach their destination, for Prejevalsky writes : "When migrating these ducks fly very low, following the plains which abound with lakes, and as soon as one is perceived which is not frozen, they at once settle down on it."

Most noticeable of all their characteristics is their voice. They are, especially the drakes, noisy birds, constantly uttering a strident, clucking call like the syllable "mok," repeated very quickly. I have heard their cry likened to that of the Cotton Teal as uttered by the latter bird when flying, but far louder and more distinctly syllableized.

As a rule, it would appear that they are inland birds, keeping much to swamps and morasses or to rivers, and less often to large open sheets of water. In Japan and Formosa it has been seen on the sea coast in tidal creeks and, I believe, even on the seashore itself.

They are shy birds and difficult of approach as a rule, but appear to become less so during the breeding season. Sociable birds, they consort with almost any kind of duck. Thus Ruddle says that he saw in company "in a small morass above the Udir rivulet, *Anas boschas, A. crecca, A. glocitans, A. clypeata, A. acuta* and a few of *A. penelops* sitting quietly close together after a meal, resting."

As regards their breeding, the two notes quoted by Hume are all there are on record.

Middendorf says : "Although the commonest duck on the Boganida (70° North latitude) it did not occur as far North as the Taimyr river. It was not observed before the 12th of June on the Boganida. On the 3rd July we found a nest on the river bank under a willow-bush containing 7 fresh eggs. On the 24th July, the young in down began to exhibit feathers on the head, shoulder and wings, but were still unable to fly on the 4th August. On the 28th July a male was shot which had lost its perfect plumage. The latest birds were seen on the 23rd August on the Boganida. This bird was similarly plentiful on the Standway mountains (Aim River) and at Udskoj-Ostrog, where it arrived during the first week of May . . . The eggs are bluish-yellow in colour and small—the smallest was 1·98″ long by 1·4″ greatest breadth."

Of course, Middendorf meant *largest*, not smallest as he gives the greatest breadth, and 1·98″ seems big for the egg, not small.

In the lines above quoted the point which will be most quickly noted is the extremely brief breeding season. Thus, although the 12th of

June is the earliest date on which the bird was seen, yet the last disappeared on the 23rd of August, giving little over two months for the whole business of making the nest, laying the eggs, hatching—which, we may presume, would take from 20 to 25 days—and bringing up the young. As it would take some 10 days to lay the normal clutch of eggs and about five at least to make the nest, the only conclusion is that once hatched the young take well under the month to arrive at their full powers of flight. As this is not quite likely, it is probable that though no birds were *seen* before the date mentioned, yet many must have arrived in late May, and when we look at the dates they arrive elsewhere, this is the most probable solution.

In the Amur they arrive and breed very much earlier. The only egg of this duck in my collection is one of many I owe to the generosity of Herr M. Kuschel of Breslau, who has given me one bearing the date "28th April, 1895." The early date of this egg supports the idea that they must breed earlier than in June in Northern Siberia also.

The egg is a typical Teal's egg, the texture very smooth and fine but without any gloss ; the shape oval with one end decidedly smaller than the other, though obtuse ; the colour is a very pale, creamy *cafè-au-lait*. In size it is 2″ long by 1·37″ broad, which makes it a rather longer, yet, at the same time, a rather narrower, egg than those hitherto described.

Taczanowski thus describes a clutch of eggs sent him from Darasan, where they breed in numbers, by Dybowski :—They are somewhat larger than those of the Garganey ; their colour is a pale greyish-green, very like that of the eggs of the Mallard. They vary from about 1·8″ to 1·9″ in length and from about 1·3″ to 1·4″ in breadth.

25. NETTION CRECCA.

The Common Teal.

Anas crecca, Legge, "Birds of Ceylon," p. 1083.

Querquedula crecca, Jerdon, "Birds of India," III, p. 806 ; Hume "Str. Feath.," I, p. 262 ; Adam, *ibid*, p. 402 ; Butler, *ibid*, IV, p. 30 ; Hume and Davis, *ibid*, VI, p. 489 ; Davids. and Wend., *ibid*, VII, p. 93 ; Ball, *ibid*, p. 232 ; Hume, *ibid*, p. 494 ; *id.*, Cat., No. 964 ; Scully, "Str. Feath.," VIII, p. 363 ; Hume and Marshall, "Game Birds," III, p. 205 ; Vidal, "Str. Feath.," IX, p. 93 ; Butler, *ibid*, p. 438 ; Reid, *ibid*, X, p. 83; Davids., *ibid*, p. 413; Taylor, *ibid*, p. 467; Oates, "Birds of British Burmah," II, p. 285; Barnes, "Birds of Bombay," p. 409; Hume, "Str. Feath.," XI, p. 346.

Nettion crecca, Salvadori, Cat. "Birds of British Museum," XXVII, p. 243.

Nettium crecca, Blanford, "Birds of British India," IV, p. 443.

Description: Adult Male.—"A broad band from the back of the eye down the nape and upper neck, metallic green, sometimes glossy black posteriorly; a narrow white line from the base of the maxilla running upwards to over the eye and the green band, and another from the fore corner of the eye running under the green band; remainder of the head and neck rich, rather dark chestnut; the point of chin or whole chin and edge of lores more or less black; lower neck, upper back, inner scapulars, sides of vent and flanks vermiculated dark brown and white; the vermiculation on the upper parts increasing in breadth towards the breast, on the sides of which they become bold black and white bars and in the middle of the breast merely round black centres to the feathers. Remainder of back brown, sometimes slightly vermiculated at the sides, rump brown, the feathers edged paler; upper tail coverts rich brown, edged buff; rectrices brown, edged paler; lower surface white; under tail coverts buff at the sides, black in the centre; greater coverts broadly edged white or buffy-white; remainder of coverts and primaries grey-brown; outermost secondaries black, edged narrowly white, the next three or four metallic green and the one next again to them black with a very narrow white margin; remaining innermost secondaries a beautiful silvery brown, and the outermost scapulars buff with broad velvety black diagonal edges.

"In the adult the bill is black or blackish, brownish on rami of lower mandible.

"Irides are brown, varying in shade from light hazel to almost black.

"The legs and feet are commonly grey with a faint olive tinge (the webs and claws in all cases dusky), but they vary in shade a little and at times are bluish-grey with a brown shade, and at others a distinctly dark slatey-grey, sepia grey, brown, greyish-brown, olive, greenish-olive, dirty greenish-plumbeous, or even plumbeous." (Hume).

I have found a green tinge on the tarsus and toes very common indeed, more so than a pure grey or plumbeous.

"Length 14·5″ to 15·85″; expanse 23·0″ to 25·25″; wing 7·2″ to 8·0″; tail from vent 3·0″ to 3·6″; tarsus 1″ to 1·2″; bill from gape 1·5″ to 1·77″; weight 7·7 oz. to 12·0 oz." (Hume).

"Total length 14·5″ wing 7·25″; tail 3″; culmen 1·0″; tarsus 1·1″" (Salvadori).

Adult Female.—Upper head dark brown, the feathers edged rufescent-white; lores, throat and neck rufescent-white; with speckly brown centres to the feathers, larger and more distinct on the neck; chin and fore throat the same but unspotted; flanks and breast more or less with dark centres to the feathers, always pretty plain on the former, but sometimes practically non-existent on the latter, though, on the other hand, they sometimes shew up as distinct, dark brown drops; the ground-colour of the lower parts may be anything from almost pure white to a distinct rufous or buff; scapulars like the back but generally more richly coloured; remainder of wing like that of the male but with the speculum usually duller.

"Length 13·5″ to 14·9″; expanse 22·5″ to 25″; wing 6·5″ to 7·4″; tail from vent 2·9″ to 3·5″; tarsus 1·0″ to 1·2″; bill from gape 1·5″ to 1·77″; weight 7·7 oz. to 12 oz." (Hume).

In young males and females the lower mandible, though sometimes only brown, commonly varies from brownish-yellow to dull orange, and is generally brownish at tip. The upper mandible also in females is usually rather paler coloured than that of the male, and is often tinged with green or plumbeous-green" (Hume).

The legs and feet also are more often tinged strongly with sienna than are those of the male. The irides are the same light to dark brown.

After the breeding season, or when the eggs have been laid, the males assume a plumage similar to that of the female but have the upper parts more a uniform brown.

Morris says: "The male assumes the plumage of the female in summer by the end of July or beginning of August, and this he retains until the general moult."

The young are like the female, perhaps rather darker in general hue, but have the pale edgings to the upper feathers more pronounced, and the spots and bars on the lower plumage more numerous and distinct, the former showing often in the centre of the abdomen and the latter on the under tail coverts.

The nestling "is yellowish-white on the under parts, buff on the forehead and throat; a dark brown streak from the forehead to the crown: which with the upper parts is brown; a dark local streak and two other streaks from behind the eye to the nape on each side" (Yarrell).

The drakes when they arrive in India are often in a beautiful transition stage and few will be found in perfect male plumage before January. I have a most handsome young male in my collection which is a very good example of the changing plumage; above it is like the female but without the broad edging to the feathers, and on the rump and upper tail coverts are a few feathers shewing the beautiful black and white vermiculations. The head is dark brown with the merest trace only of the black eye-streak; the under plumage is pure white, but all along the flanks, vent and under tail coverts and here and there on the abdomen are still left feathers of the old plumage which are a bright rufous-buff. The new feathers of the flanks are like those of the adult male, and the breast is beautifully spotted with distinct oval drops; the upper breast and neck is a dull rufous.

From the above description it may be seen that it does not follow that because one year a bird has rufous or rufescent plumage he will have the same again after the next moult. In the bird just described the new plumage is a very pure white, but the old patches are exceptionally bright rufous. From this we might infer that the habitat and its water has much to do with the coloration of the lower parts, yet a female in new plumage shot with this young male is very rufous indeed.

The Common Teal extends throughout the Palæarctic region in the summer, breeding as far south, according to Hume, as the 40° North Latitude, and migrating south during the cold weather into Northern Africa as far as Abyssinia on the east and Wadan on the west, practically the whole of Southern Asia, and the Atlantic coast of North America. It occurs, though rarely, in Greenland.

In British India it is found everywhere with very few exceptions. From the extreme north down to Cape Comorin it is very abundant, though perhaps more so to the north than to the south, but even there it is spoken of as appearing in flocks of hundreds.

Hume gives the exceptions to its habitat as follows: "The Laccadives, the Andamans and Nicobars, Tenasserim, southern, central and north-east of the Salwein, and possibly Malabar."

From these places must now be struck off the Andamans, Nicobars and Malabar, in the latter place having been found frequently since "Game Birds" was written.

In Legge's "Birds of Ceylon" it is said not to occur in the Phillipines, but lately I have heard that it has been met with there also.

Hume seems to think that *Querquedula circia* arrives in India earlier, if anything, than the present Teal, but further observations have shewn them to arrive at much the same time, though one year the Garganey may be first and the next year the Common Teal.

In 1898, I have had quite numerous records of their arrival in Northern India and Assam in August, the earliest being that of a small flock seen on the 22nd of that month. Hume says: "In the more Northern Plains portion of the Empire, though a few are seen during the latter half of September and exceptional cases have been reported of their appearance some weeks earlier even than this, I think we may say that the first heavy flights arrive during the first week of October." Hume, I think, refers in this paragraph mainly to North-Eastern and Central India, and it would therefore really seem as if the Common Teal were earlier in Northern Bengal than in those parts, reversing what is the usual rule with most, if not all, other migratory ducks. By this I do not mean to say that the Teal are all with us by September even in the northern parts of Assam, but I do mean to say that by the middle of that month they are quite common in many parts and in some are fairly numerous by the second week.

It is possible, indeed probable, that our Eastern birds are those which come from China, and as they breed there as far south at least as the 40° latitude, they have not nearly so far to come as those which travel from the West, few of whom really come from further south than about the 50th degree.

Teal are extremely variable in the numbers in which they collect. Often they may be seen singly or in pairs, and at the same place flocks may be seen numbering their hundreds, even thousands. The largest flocks appear to be met with in Sind and the north of the North-West Provinces and the Punjab and perhaps Northern

Rajputana. In these places they are to be seen literally in flocks of many hundreds and frequently of thousands. On the Sunderbands I think I have seen as many as five hundred in a flock ; in the famous Chilka Lake I have been told of their rising in vast flocks which must have been nearly a thousand strong, and from other parts of India reports are given of flocks numbering hundreds.

The most common sized flock all over their range may be somewhere between twenty and forty, and in Southern India, *i.e.*, from Mysore to Ceylon, anything over the latter number is rare, though even in the island Mr. G. Simpson, as quoted by Legge, says : "In the Island of Delft and at the Palverainkadoo lagoon, on the north-west coast, it appears yearly in thousands in November, leaving at the end of February."

The Common Teal is one of the most attractive of the duck tribe to the sportsman, both from its being so numerous and from its habits. Although mainly a night feeder, yet in places, where its food-supply lies in the flooded rice fields and the edge of swamps, bhils, etc., it will continue to feed for an hour or so after daylight and even when it has finished feeding it remains in amongst the weeds, reeds and other cover near the shores. It thus affords excellent sport whether with a dog or two or a few beaters, or from some small dug out, poled quietly along by a single man in the stern. The Teal often lay close enough to allow of constant shots at from twenty-five to forty yards and, as they often scatter a good deal even when resting, two or three shots may be obtained at the same flock. In this way on large sheets a good bag may be made before the birds get scared and leave altogether or else rise far out of shot.

Nowhere in Bengal have I found Teal to be of a very confiding nature, but that they are so in some parts of their Indian habitats is well known. Hume writes: "They are, as a rule, when met with near villages or in densely-populated portions of the country, excessively tame—too tame to render shooting them possible unless you really require them for food. Not only will they let you walk up to them when they are on a village pond—as close as you please—but when you have fired at them and killed two or three, the remainder, after a short flight, will again settle, as often as not, well within shot. Nay, at times, though fluttering a good deal, and looking about as if astonished, they will not rise at all at the first shot, despite the fact of some of their comrades floating dead before them."

In open waters such as rivers, &c., and when on the wing, Teal often fly much bunched and close together, and form shots which much encourage the bad habit of shooting *into the brown*, quite small flocks often providing from half a dozen to a dozen teal to a couple of barrels of an ordinary smooth bore. Of course even *into the brown* one must hold fairly straight as the Teal yields to no duck in the speed of its flight, in addition to which the sudden sweeps and turns they take often disconcert the gunner.

They stand a fair amount of shot unless hit well forward, when a single pellet of No. 6 or 7, or even of No. 8 may suffice to bring the bird to bag.

Hume says that they swim easily but not very rapidly and that they cannot dive to much purpose. Whilst agreeing with his estimate of their swimming powers, I can hardly, however, do so with that of their diving. If shot in open water they can be brought to hand easily, for they do not dive for long and not particularly quickly, but if shot amongst weeds, they are wonderfully smart in hiding and in dodging in and out amongst them, as also in secreting themselves by holding on to the weeds so that they lie entirely under the water except the tips of their bills. I found that in the Sunderbands they nearly always made for the water lillies, hiding under one of the huge leaves.

They walk well and can even run if necessary, but they do not care for the land, nor do they rest on it but on the water where there is cover. They rarely feed on really dry land but frequently in paddy fields, etc., where there are a few inches only of mud and water. As already said, they are principally night feeders, but where quite undisturbed they feed during all but the hottest hours of the day, say from 11 a.m. to about 3 p.m. Their food is undoubtedly mainly vegetable, but they do not despise worms, insects, etc., which may come in their way. For the purpose of obtaining food their diving is said not to extend beyond the peculiar semi-dive so much indulged in by the domestic duck which leaves the tail-end well out of water.

They are excellent eating and, however poor in condition they may be, never seem to get any objectionable flavour ; so good are they to eat, indeed, that they are often kept in Tealeries in Western and

Northern India so as to be available during the hot weather and rains. I have no personal knowledge of such Tealeries, and as Hume's account of what they should be is about as full and good a one as it is possible to have, I must again indent on that much-quoted author. He says: "Fresh water, and plenty of it, is the first requisite, and to ensure this, the tealery should always be located near the well, and every drop of water drawn thence for irrigating the garden made to pass through it. The site should be, if possible, under some large umbrageous trees, such as we so commonly find near garden wells, and to the east of the trunk, so that the building may be completely protected from the noontide and afternoon sun. You first make a shallow masonry tank,—twelve feet by eight and ten inches in depth is amply large. Four feet distant from this all round you build a thick mud wall to a height of three feet from the interior. The whole interior surface of this wall and the flat space between it and the tank must be lined with pukka masonry, and finished off with well worked chunam. The great points to be aimed at are to have the whole lower parts so finished off as to be on the one hand impregnable to rats, ichneumans and snakes; on the other to present no crevice in which dirt, ticks and other insects can lurk. Outside the walls must be quite smooth so that no snakes can crawl up them. On the wall you build stout square pillars, four feet high, on which you place a thick pent thatch roof. At the spring of the roof you stretch inside a thin, rather loose, ceiling-cloth to prevent the birds hurting their heads when they start up suddenly, as they will, at first, on any alarm, and especially when the sweeper goes in to wash out the place. The interspaces between the pillars you fill in with well-made cross-work (*jaffri*) of split bamboo, except one of them in which you place a door of similar work made with slips of wood. You must arrange that all the water both enters and leaves the building through gratings impervious to snakes and like marauders. Two or three feet outside the walls run a little groove, a ditchlet, in which plant early in the year mulberry cuttings, which will form a good hedge round the place, and keep the sun and hot winds off the building; but this must be kept neatly trimmed inside, or it would interfere with ventilation, and must not be allowed to get higher than the eaves.

"Into such a building in February or March, you may turn 200 Teal, some Common some Garganey, as you can get them. A few Gadwall and Pintail will also do no harm, but they do not thrive so certainly as the Teal ; and the Garganey, though very good, is not equal for the table to its smaller congener."

Teal have on so many occasions been found at different times between June and August in India that ornithologists have been always kept in a state of semi-expectation that their nests would be found somewhere within our Indian limits, either in Kashmir or some of the Himalayan lakes. Still time has gone on and no such nest has yet been taken and, personally, I think, it is unlikely one ever will be. Amongst the many thousands shot annually, it would be strange if some few, whilst escaping death and even severe wounds, did not receive internal injuries, invisible themselves after a brief period, yet quite sufficient to incapacitate the bird from migration. This would be quite enough to account for the few birds met with at abnormal times, and though these might appear strong and robust on the wing, yet it does not follow that they were equally so a week or ten days before they were noticed. They breed practically over the whole of their Northern habitat as far south as the 40th degree, but in the southern portion of this range they only breed here and there in very small numbers. They breed freely in Northern England and in Scotland though seldom in the southern countries, yet they have been recorded at this season and their eggs have been taken in Spain, Greece, North Italy and South Russia.

They breed very rarely in Greenland, plentifully in Iceland, but not much in the extreme north of Europe and probably not at all in the extreme north of Asia. Throughout Southern Siberia, Manchuria and the Amur a great number breed, and a few also in the north of Japan.

They generally make their nests at the edge of swamps and other pieces of water, often where there is actually a little water standing and, even where they make them at a distance from any water, the site chosen is nearly always a wet and boggy one. Thus in Scotland they sometimes breed on the moors in amongst the heather, but they always select some dip which keeps more or less damp and where the water may occasionally collect.

The nest is a large unshapely mass of vegetable stuff, rushes, weeds and such-like lumped together in a mass, with a depression in the centre containing a little down.

In Finland Dresser found the nests placed under bushes or in tufts of grass, and often at some distance from the water.

Legge's note on the nesting of this Teal is so complete yet short that I reproduce it. He writes : "This species breeds in May and June, resorting to extensive marshes, heaths near water and large peat bogs. The nest is made on the ground among grass or rushes, or in thick heather, in which latter case it is placed sometimes in the middle of a clump. The nest is made of dead flags, rushes, grass, reeds, etc., with a capacious interior, which is amply lined with down plucked from the bird's breast. The number of eggs varies from eight to fourteen, and occasionally as many as twenty have been found in a nest ; they are small for the size of the bird, oval, but slightly more obtuse at one end than the other, of a uniform creamy white or pale buff. There is a greenish variety sometimes found, very like a Pintail's egg. A series before me from Petchora, taken by Mr. Seebohm, varies in length from 1·58″ to 1·7″ and in breadth from 1·16″ to 1·27″. The old birds are said to manifest great affection for their young. Macgillivray relates an instance of his finding a brood of young with their mother on a road ; and when he took them up to put them to a pond close by, whither he thought the old bird was leading them, she followed him, fluttering round within reach of his whip."

"The 'nest-down' is dark brown, with pale whitish centres, but no pale tippings."

It is said to be a resident in Egypt according to Capt. Shelly, and on Heuglin, and to be very plentiful there.

I have two clutches of eggs which seem to average a great deal larger than most. The two clutches, twelve eggs, average 1·76″×1·31″, the longest being 1·83″ and the broadest 1·32″. In shape they are broad ovals, very regular, yet all perceptibly smaller one end than at the other. A few eggs are rather longer comparatively, and these generally have the smaller end rather more compressed. The texture is fine, close and smooth, and in some cases has a faint gloss. All my eggs are a pale buff, and vary hardly at all in depth of colouring.

26. NETTION ALBIGULARE.

*The Oceanic or Andaman Teal.**

Mareca punctata, Ball, "Str. Feath.", I, p. 88.

Mareca albigularis, Hume, "Str. Feath.", I, p. 303.

Mareca gibberifrons, Hume, "Nests and Eggs", p. 644 ; *id.*, Cat., No. 966, ter ; Hume and Marshall, "Game Birds of India", III, p. 243 ; Hume, "Nests and Eggs", (Oates' edition), III, p. 290.

Nettion albigulare, Salvadori, Cat., "Bird of British Museum", XXVII., p. 257.

Nettium albigulare, Blanford, "Avifauna of British India", IV, p. 444.

Description : Adult Male.—"Upper part of the head brown ; this colour also covers the upper parts of the cheeks and gradually changes into the white of the lower parts of the cheeks and throat ; the brown of the cheeks with obsolete dusky streaks ; round the eye there is a ring of white feathers ; in some specimens on the lores and at the base of the bill there are some white feathers ; upper parts brown, the edges of the feathers of the back and scapulars pale brown ; rump uniform, the feathers of the breast and abdomen pale brown in the centre, and broadly margined with brownish fawn-colour, producing a mottled appearance ; under tail coverts brown, almost uniform ; upper wing coverts dark brown, greater or last row of wing coverts white, forming a band, diminishing in breadth and tinged with brown inwardly ; speculum velvety black, with a longitudinal, coppery-green band in the middle, from the seventh to the ninth secondary, and bounded on the tip with a buff band ; the first secondary broadly white on the outer web ; tertials broadly velvety black on the outer web ; primaries brown with an olive lustre ; under wing coverts brown, the median ones tipped with white ; axillaries white ; tail brown" (Salvadori).

"Legs and feet greenish-blue to plumbeous ; webs usually darker ; claws horny ; bill greenish-blue, plumbeous or plumbeous-blue, nail black ; in some the lower mandible tinged with, in one the terminal two-thirds of this, pink ; irides reddish-brown to deep brownish-red."

"Length 16″ to 18″ ; expanse 24·5″ to 27″ ; tail from vent 4″ to 4·2″ ; wing 7·5″ to 8″ ; tarsus 1·3″ to 1·4″ ; bill at front 1·4″ to 1·5″ ;

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* As the trivial name for *N. gibberifrons* will probably remain THE OCEANIC TEAL, it may be as well that Blanford's term, the ANDAMAN TEAL be accepted finally for this form of *Nettion*.

from gape 1·7″ to 1·8″; wings when closed reach from 2″ to 2·2″ from end of tail; weight 1 lb." (Hume.)

"Rectrices 16″" (Blanford). This refers to male and female.

Female.—Similar to the male but smaller, and the lower surface duller and the centering of the feathers less marked, the green band on the wing-speculum less coppery. Total length 15·5″ to 16″; wing 7·25″ to 7·4″; culmen 1·3″ to 1·35″" (Salvadori).

"Length 15″ to 16″; expanse 24″ to 25·5″; tail from vent 3·25″ to 3·5″; wing 7·1″ to 7·4″; tarsus 1·25″ to 1·35″; bill at front 1·3″ to 1·4″; wings when closed reach to within from 1″ to 1·75″ of the end of the tail; weight 12 oz." (Hume).

"*Young birds* are similar to the females, but the dusky markings to the underparts are even less distinct" (Salvadori).

A young bird caught by Mr. Butler and described by him in a letter to me was "Similar to the adult, except that the ring round the eye was very narrow and tinged with fulvous. Bill and feet as in adults; eye dark brown instead of reddish-brown."

This teal is confined to the Andaman islands, but Mr. C. W. Allan shot a specimen of this species at Bassein, Burma, which was found amongst a flock of Whistling Teal on the 15th April, 1898. This bird was recorded in *the Asian*, and Mr. F. Finn wrote to me that he identified the skin himself, and without any doubt it was that of an Andaman Teal. Nothing was noted as to whether the specimen was a drake or a duck. It was probably driven on to the Burmese coast during some storm, having ventured too far out to sea from the Andamans.

Nettion gibberifrons, *N. castaneum* and *N. albigulare* are very closely allied; for a long time the first and the last were confounded with one another, and even now it is by no means settled that *N. castaneum* and *N. gibberifrons* are not one and the same bird. The young males and females are absolutely indistinguishable but the adult male *N. gibberifrons* has been found to attain a further plumage, which, hitherto, no *N. castaneum* has been found to acquire. *N. albigulare* differs from both these birds in having the sides of the head darker and more uniform in colour, and the darker streaks to the feathers obsolete, but the main difference lies in the Andaman Teal having the white ring round the eye, and the first secondary broadly edged with white.

There is a good plate of *Nettion albigulare* in the British Museum Catalogue, and on the same plate is shown the head of *N. gibberifrons*, thus giving a comparison between the two birds.

There is very little on record about this teal, and it is to be hoped that observers will soon add to our knowledge of it. By far the most important note on its habits is that contributed by Mr. A. L. Butler to this journal. Lately as this interesting note has appeared, I feel that there is no apology needed, except to Mr. Butler, for again producing it here, nor would any account of the Andaman Teal be up to date were it omitted :—

" When I arrived at Port Blair in May, these teal were in good sized flocks, resorting principally, at low tide, to two little rocky islets, up the harbour, known as Bird Island and Oyster Island. I did not go after them at that time myself, not having a boat ; a fair, though not large, number were killed by some of the officers stationed here. I believe eleven was the result of four barrels on one occasion ! As the monsoon commenced and the harbour become rougher, at the beginning of June, these flocks of teal broke up into smaller parties of five or six to a dozen or so, and retired to the creeks and dyke-intersected marshes, a little inland, near Bamboo flat and Port Monatt. Towards the end of June these small parties began to break up into pairs, about this time I shot several, and in the paired birds I found the testes of the males enlarged, but the ovaries of the females were as yet in ordinary condition. In the 'Game Birds of India' Mr. Hume mentions a single nest found in August, and I should think that August or the end of July would be the usual time of laying. I am afraid I am not likely to find a nest, as there are so many hundreds of acres of suitable breeding ground, and the birds are comparatively few."

"The Oceanic Teal feed a good deal in the paddy fields at night; under cover of darkness, too, a few birds often drop into small tanks at Aberdeen within a few yards of bungalows and buildings. When in flocks they are very wild, but in pairs, in the small channels among the marshes, I found them very tame. I have often been able to creep up to the water's edge and watch a pair swimming quietly about within ten yards of me for some time. On one occasion I came right on to a pair under an overhanging bush, and they only fluttered, like water hens, along the surface for twenty yards or so, then pitched and commenced swimming away, so that I was able to kill one on the water and the other as it rose, from where I stood. Of course birds that have been shot at a bit go clean away at the first alarm. On these creeks they associate with the Common Whistling Teal, and I have watched the two species in close company on the water, though the Oceanic Teal separate from the others when put up. The only thing I noticed about them, which I do not think has been recorded, is that they have a 'quacking' note as well as a low whistle. One day a party of eight or ten, at which some shots had been fired, after wheeling round and round for some time, pitched on a narrow channel, within thirty yards of me, as I stood concealed in the bushes on the bank. I watched them for some minutes, when another pair, frightened by some distant shots came scurrying over; the birds on the water all twisted their heads up and set up a loud, rapid quacking call note which they kept up for some minutes. The new comers circled round several times, but probably seeing the top of my *topee*, concluded not to join their companions in their fancied security. The flight of this teal is fairly fast. Occasionally, when they have been kept on the wing for some time a party will stoop down to the surface of a creek as if they meant to pitch, and then change their minds and rise again. When exercising this manœuvre they fly past at a tremendous pace. The white wing bar, in this species, is most conspicuous when the bird is on the wing."

" Winged birds promptly swim for the nearest cover, into which they scuttle off at a great pace and are generally lost without a dog. One I shot swam steadily along in front of a Pathan convict, who was swimming after it, in the capacity of a retriever, and though hard pressed made no attempt to dive until it reached the bank, where it was caught. One of the officers stationed here has a live bird in captivity which was pinioned by a shot some months ago. It thrives well on paddy, but has not become very tame. It spends most of the day asleep with its head resting in the plumage of the back. The local sportsmen have christened them Gibberies."

" They are rather difficult birds to skin, being very fat, and having, for a duck, rather a tender skin. They seem to average about 15 oz. in weight."

To this note Mr. Butler adds the following information which he has kindly sent me in a letter: " On December the 2nd I was snipe-shooting at a village called 'Onikhet.' Walking down a *band* which was over-grown with rank grass, I almost put my foot on an Oceanic Teal, which fluttered away in front of me, trailing its wings and feigning lameness. Of course I thought I had got a nest at last, but a rippling movement in the grass in different directions showed me that it was a brood of young ones that I had come across. I instituted a most careful search, but only came upon one youngster which I caught. All this time the duck was flying round and round within twenty yards, uttering a low double quack. The drake also appeared on the scene, but kept further off and was silent."

Davison writing of the Andaman Teal says: "It appears to frequent alike both fresh and salt water. During the day it either perches among the mangroves, or settles down on some shady spot on the banks of a stream, when wounded it does not attempt at first to dive, but when hard pressed it dives, but does not remain long under water, and appears soon to get exhausted. It feeds by night in the fresh-water ponds, and I was informed that it is to be seen during the rains in small flocks in the paddy fields about Aberdeen in the mornings and evenings. Sometimes, in going up the creeks, a pair will slip off the bank, into the water, and keep swimming about twenty yards ahead of the boat, only rising when hard pressed, but they are more wary when in flocks. I could learn nothing about the breeding of this species. The only note I have heard them utter is a low whistle, and this apparently only at night when they are feeding."

The only note on the nidification of the Andaman Teal that I can find is the one in "Nests and Eggs" quoted in all other works. It is :—

"Very little is yet known of the breeding of this species. I have only one note of its nidification and one egg, both of which I owe to Capt. Wimberly."

"The nest was found in August: it was composed of grass, and was placed in a paddy field near Port Monatt, the only locality with which we are yet acquainted in the group, where this species is always to be met with."

"The egg is typical, a very perfect broad oval in shape, with a very close-grained, smooth, shell, devoid of gloss, and of an uniform delicate cream colour."

"It measures 1·93″ by 1·43″."

DESCRIPTIONS OF SIX NEW SPECIES OF SCORPIONS FROM INDIA.

By R. I. Pocock, of the British Museum of Natural History.

(*Read before the Bombay Natural History Society on* 14*th June*, 1898.)

The species of scorpions here described have either come to hand or been recognized as new since the publication of my paper dealing with some new species of these animals in No. 1, Vol. XI, of this Journal. The species of *Isometrus* and *Archisometrus* were received through Mr. R. C. Wroughton from the Bombay Natural History Society; those belonging to *Chærilus* and *Scorpiops* form part of the collection in the British Museum.

Family BUTHIDÆ.

Stenochirus politus, sp. n.

Colour.—A deep shining blackish-brown on the tail and the upper side of the trunk; lower surface of trunk, legs, mandibles, and palpi not quite so dark as the tail, and the three distal segments of the legs quite pale; digits also pale, brownish at the base.

Carapace granular in the depressions laterally and posteriorly; tergal plates granular laterally and on each side of the median keel, smooth elsewhere; 5th tergal plate closely granular throughout in its posterior half. *Tail* granular above in the median groove, the rest of it smooth and polished above and below, without crests and without granules, but distinctly though not coarsely punctured, tail very slightly increasing in width to the middle of the 4th segment, which is a little longer than broad (3 × 2½), the length of the 2nd segment equal to the width of the 4th; vesicle of tail punctured; aculeus thick at the base.

Palpi slender and elongate; humerus weakly crested and granular in front; brachium smooth, without crests or granules; two conspicuous setal pores on its upper side; hand also smooth, narrower than brachium; digits long, the movable more than twice the length of the hand-back, and armed with 10 rows of teeth.

Pectinal teeth 15.

Measurements in millimetres.—Total length 33, length of carapace 3, of tail 20; width of 1st segment 2·3, of 4th 2·6.

Locality.—Kanara (*T. R. D. Bell*). A single example.

The genus *Stenochirus* is new to the fauna of Hindustan. Hitherto it has been represented by a single species (*S. sarasinorum*), described by Karsch, from Ceylon (Berlin Ent. Zeitschr., XXXVI, p. 305, pl. xii, fig. 30, 1892). The last-named species is unknown to me, but judging from Karsch's description and figure, it may be distinguished from *S. politus* by its shorter fingers and broader hand, the movable digit being, according to the figure, less than twice the length of the hand-back, and the hand is wider than, or at least as wide as, the brachium. Again, in the tail of *S. sarasinorum* the length of the 2nd segment is much less than the width of the 4th. Moreover, nothing is said in the description given by Karsch of the granulation of the carapace and dorsal plates of the abdomen which is so noticeable in *S. politus*.

Isometrus brachycentrus, sp. n.

Colour of trunk a deep blackish-brown, obscurely variegated with brownish-yellow ; the interocular triangle on the carapace black ; the terga with a clear spot on each side of the middle line, from which an obscure but irregular brown band is traceable forward ; thickened edge of terga black, but just within the edge is a paler band ; tail reddish-brown, with the median inferior intercarinal space ornamented with a black stripe, which behind fuses on each side with a black patch occupying the lateral inferior intercarinal space : this black is more developed on the posterior than on the anterior segments ; the 5th segment, with the exception of its anterior part, entirely fuscous below, above, and at the sides; vesicle reddish-brown, with part of the spine and of the aculeus black ; palpi mostly a uniform reddish-brown, with merely a few black patches on the outer side of the hand and brachium ; fingers, except their tips and the area of the hand at the base of the immovable digit, black ; legs very strongly infuscate externally; on the posterior leg the femur and tibia almost wholly black with only one or two yellow spots ; abdominal sterna not distinctly variegated with black, the 3rd and 4th slightly infuscate at the sides, the 5th more strongly so at the sides and behind.

Trunk entirely covered above with fine granulation. Tail also finely but not quite so closely granular ; the crests all distinctly granular ; the vesicle also granular at the sides and below, with a strongish median crest ; the spine large with a bluntly rounded point, armed on the front edge with three granules ; aculeus short and strongly curved ; 2nd caudal segment with eight keels; tail about five times the length of the carapace, slender; the 1st segment a little longer than wide; 4th segment more than twice as long as wide, as wide as the brachium. *Palpi* with hand granularly crested above, denticulate internally, its width a little greater than that of the brachium and nearly two-thirds as long as the hand-back; hand-back three-quarters the length of the movable digit, which is armed with six rows of teeth, the external series consisting of seven.

Pectinal teeth 12.

Measurements in millimetres.—Total length 42, of carapace 4, of tail 23·5.

Locality.—Mangalore (*Battie*), and Kanara (*T. R. D. Bell*).

This species is related to *Isometrus basilicus*, described by Karsch, from Ceylon, of which the British Museum possesses male and female examples obtained by Mr. E. E. Green at Haldumullah in this island.

The resemblance lies in the form of the vesicle and aculeus of the tail, size of hand, pectinal teeth, etc., but this new form differs in being more strongly granular with a narrower tail, etc.; the colouring also is different, the palpi in *I. basilicus* being much more spotted with black, while the upper side of the trunk and legs are much more noticeably spotted with yellow; the tail too is yellow and spotted, and blotched throughout with black.

Isometrus acanthurus, sp. n.

Colour variegated yellow and black; carapace lined with black, its anteocular area infuscate, spotted with yellow; tergal plates ornamented with fine black lines separated by yellow patches; 4th and 5th sternal plates lined with black; tail mostly yellow, delicately lined with black; the 5th segment blacker posteriorly; vesicle also lined with black; legs and palpi spotted; hand slightly spotted externally; fingers pale, spotted externally.

Trunk and tail finely granular; terga with a median keel; sterna smooth, the 4th laterally granular, the 5th granular throughout, with four keels. *Tail* long and slender, about seven times the length of the carapace; the 2nd segment with only eight keels; terminal granule of superior keels on 2nd and 3rd segments long, erect, and spiniform; vesicle elongate, granularly crested below; the aculeus short strongly curved; spine triangular, but with blunt apex.

Chelæ with hand smooth, large, wider than brachium, its width about half the length of the hand-back ; digits short, the moveable only as long as the hand-back, armed with seven (eight) rows of teeth.

Pectinal teeth 16.

Measurements in millimetres.—Total length 39, length of carapace 4, of tail 27.

A single ♂ example from Matheran, received from Mr. H. M. Phipson. In the thickness of the hand and shortness of the digits this species, as well as in the form of the vesicle, shortness of the aculeus, etc., resembles *I. basilicus* of Karsch from Ceylon ; but in the latter the spine on the vesicle is not triangular but has a rounded edge ; the tail too is much less coarsely granular, being almost smooth ; and the superior keels of the 2nd and 3rd segments terminate posteriorly, not in a slender upstanding spine, but in a low triangular tubercle.

Archisometrus nigristernis, sp. n.

Colour variegated black and yellow ; anteocular area of carapace and mandibles black, rest of the carapace lined with black ; dorsal plates of abdomen with three interrupted black bands, separated by interrupted yellow bands ; tail spotted and lined with black, the 4th and 5th segments blacker posteriorly ; sterna of abdomen marbled with black, the posterior more strongly than the anterior ; legs spotted with black ; palpi (chelæ) with femora spotted ; brachium entirely black, hand spotted externally ; fingers pale.

Trunk coarsely granular ; tergal plates with only one keel, sternal plates smooth and polished, except the last, which is finely granular, and is provided with four distinct keels. *Tail* about five times the length of the carapace, of medium strength, the intercarinal spaces finely granular, the crests strong and serrulate ; the apical granule of the superior keels of the first four segments and of the superior lateral keel of the first three a little enlarged ; the 1st segment only with ten keels ; the medial lateral keel represented on the 2nd segment by merely a few granules ; vesicle coarsely and serially granular below ; the spine pointed.

Chelæ slender, brachium and humerus granular and normally crested, hand without crests, scarcely toothed internally, narrower than the brachium ; digits long and contiguous, the movable a little more than twice the length of the hand-back and supplied with seven (six) rows of teeth.

Pectinal teeth 15-16.

Measurements in millimetres.—Total length 37 ; carapace 4 ; tail 21.

Locality.—Dehra Dun, Western Himalayas (8,000 feet). A single specimen obtained by Mr. F. Gleadow.

Differs from the previously described Indian species in having only eight keels on the second caudal segment, and the sterna strongly infuscate. With the Indo-Malayan forms, *A. scutilus*, Koch, A. *flavimanus*, Thor., etc., which have the same number of keels in this segment, there is no occasion to compare this species here.

Family VÆJOVIDÆ.

Chœrilus tricostatus, sp. n.

Colour (dry specimen) tolerably uniform reddish-brown, mottled with black, paler below.

Carapace closely granular laterally below the longitudinal keels ; groove behind tubercle also granular, at least the anterior half of the area in front of the tubercle granular, with sometimes scattered granules extending almost back to the tubercle ; carapace shorter than the 1st and 2nd caudal segments, about equal to the 2nd and 3rd, also equal to the 5th. *Terga* finely granular throughout, a few coarser granules along the posterior margin and a few more in front of these ; the lateral keels distinct and granular, though short, on segments 3-7.

Tail rather less than four times as long as the carapace, the 2nd segment about as wide as long ; the keels normal, granular ; the upper surface nearly smooth, at most finely granular, lateral and inferior surface more coarsely granular ; vesicle normal in form, weakly granular behind on its lower side ; length of vesicle and aculeus a little excelling that of the carapace.

Sterna of abdomen smooth, except the last, which has a pair of obsolete granular crests on each side.

Chelæ.—Humerus smooth behind, granular elsewhere, the two superior crests granular ; brachium with weakly granular crests, its anterior surface smooth, with a few granules above ; hands rather long and narrow, the length of the hand-back exceeding that of the carapace, but not twice as great at the width of the hand, finely granular, but provided with only *three* distinct weakly granular keels in addition to the two that border the hand-back externally and internally ; movable digit not lobate, a little shorter than the hand-back, just about equal to the carapace in length, with 11 rows of teeth along its inner edge.

Pectines with 5-6 teeth.

Measurements in millimetres.—Total length 48 ; length of carapace 7·5, of tail 29 ; length of brachium 8, of hand-back 8·5, of movable digit 7·5 ; width of hand 5.

Locality.—Sadi, in the Khasia Hills (Colonel Godwin Austin). Two male examples.

Differing from all the known species of the genus in possessing but three keels on the upper and outer surface of the hand.

Scorpiops crassimanus, sp. n.

Colour a uniform deep blackish-brown, variegated with dull reddish-brown.

Carapace granular in front and laterally ; ocular tubercle smooth sulcate ; carapace as long as the 1st and 2nd tail segments and about one-third of the 3rd ; dorsal plates of abdomen granular throughout, the last weakly crested. *Tail* about three-and-a-half times the length of the carapace, moderately robust ; the keels normal in number and granular, the superior keels of the 2nd, 3rd, and 4th segments a little enlarged posteriorly, the intercarinal spaces granular, the superior more finely so than the lateral and inferior ; vesicle also finely granular, its width a little greater than its height, and about equal to the width of the 5th caudal segment. Sternal plates of abdomen smooth and polished, except the last, which is granular and weakly crested.

Chelæ rather coarsely granular ; upper and lower crest on humerus and brachium granular ; the brachium with a couple of small teeth in front and eight setiferous pores below ; hand wide and high, its width a little exceeding the length of the hand-back, and only a little less than the length of the movable digit ; its upper surface lightly convex and, like the outer surface, somewhat coarsely granular, the finger-keel of the hand as well as its inner edge and the keels of the hand-back coarsely granular, a supernumerary granular keel upon the middle of the outer surface of the hand ; inner surface of hand finely granular, with a granular crest close to its upper edge ; movable digit lightly sinuate, immovable correspondingly broadly lobate. *Legs* finely granular externally.

Pectinal teeth 5-6.

Measurements in millimetres.—Total length 48 ; length of carapace 7-5, of tail 28 ; width of brachium 3, of hand 6; length of hand-back 5-8, of movable digit 7.

Locality.—No doubt India or Burma, but unfortunately the history of the typical example preserved in the Natural History Museum is unknown.

In the small number of its brachial pores and structure of the superior caudal keels this species falls into the same category as *Sc. Hardwickei*, Gervais, *Sc. Petersi*, Poc., and *Sc. leptochirus*, Poc. From the first it may be recognised by having the upper crest on the brachium and hand weaker and granular, and from the last two in having the width of the hand greater than the length of the hand-back, and the last abdominal sternal plate weakly crested.

A MONOGRAPH OF THE PILL-MILLIPEDES (*ZEPHRONIIDÆ*) INHABITING INDIA, CEYLON, AND BURMA.

By R. I. Pocock, of the British Museum of Natural History.

Part I. (With Plate A.)

(*Read before the Bombay Natural History Society on* 14*th of June*, 1898.)

The Millipedes, which form the subject of the present paper, are so striking in appearance, and occupy so unique a position amongst terrestrial arthropoda, that they must be familiar objects to all who have paid any attention to the Indian invertebrate fauna. It is consequently not necessary for me here to occupy any time and space in pointing out the chief characters of the class to which they belong. Suffice it to say that the only group with which the Pill-Millipedes are likely to be confounded are the Woodlice, and although the resemblance between a Pill-Millipede and a Woodlouse is at first sight striking enough on account of the peculiar formation of the body, which renders it capable of being rolled up in a ball, there can in reality be no difficulty in distinguishing the two if the underside of the segments be examined. For it will be apparent at once that whereas in the Woodlouse, which belongs to the class *Crustacea*, there is only one pair of legs to each segment, in the Millipedes most of the segments are provided with two pairs of limbs. Moreover, the hinder end of the body in the crustacean is composed of a number of small segments more or less closely crowded together, but in the Pill-Millipede the last segment is much enlarged, and acts as a kind of protective cover to the lower side of the body when it is spherically rolled. Of course there are other differential characters between the two not less striking than that already mentioned ; but it is needless to enter into them here.

The Pill-Millipedes of India, Ceylon, and Burma are referable to two genera belonging to the family *Zephroniidæ*. These genera are *Arthrosphæra* and *Zephronia*. They may be easily recognized by the following characters :—

a.—Apex of the legs broad and truncate, the upper angle bearing a long spine, above the claw, there being a considerable space between the claw and the spine (Pl. A, fig. 11). In the female the vulva is composed of three distinct pieces placed together in the form of a cone. In the male the movable digit of the hinder pair of copulatory feet is composed of a single segment .... *Arthrosphæra.*

b.—Apex of the legs narrowed and pointed, the spine and the claw nearly contiguous (Pl. A, fig. 11*a*); vulva in the female composed of only two pieces, a basal which bears the aperture, and a distal, the so-called cap, which is smooth and polished ; in the male the posterior pair of copulatory organs have the movable digit distinctly bi-segmented ....*Zephronia.*

These two genera also appear to be distinct in their geographical distribution, *Arthrosphæra* being known so far only from Ceylon and the more southern parts of India, whereas *Zephronia* occurs only in Burma and the north-eastern parts of India, *e.g.*, Assam.

It may be added that the vulva mentioned in the above diagnosis is the generative plate of the female, which is found attached to the basal segments of the second pair of legs, and that in the male there are two pairs of copulatory feet, both being pincer-like, situated beneath the last or anal segment. The males further differ from the females in having the apical segment of the antennæ enlarged.

Genus ARTHROSPHÆRA, Pocock.

Ann. Mag. Nat. Hist. (6), XVI., p. 410 (1895).

Arthrosphæra pilifera (Butler). (Pl. B, fig. 7.)

Syn. *Zephronia pilifera*, Butler, Ann. N. H. (4), X., p. 357 (1872); id., Proc. Zool. Soc. Lond., 1873, p. 180, pl. xix, fig. 7.

Colour dark ochraceous, dull ; head and nuchal-plate polished and black.

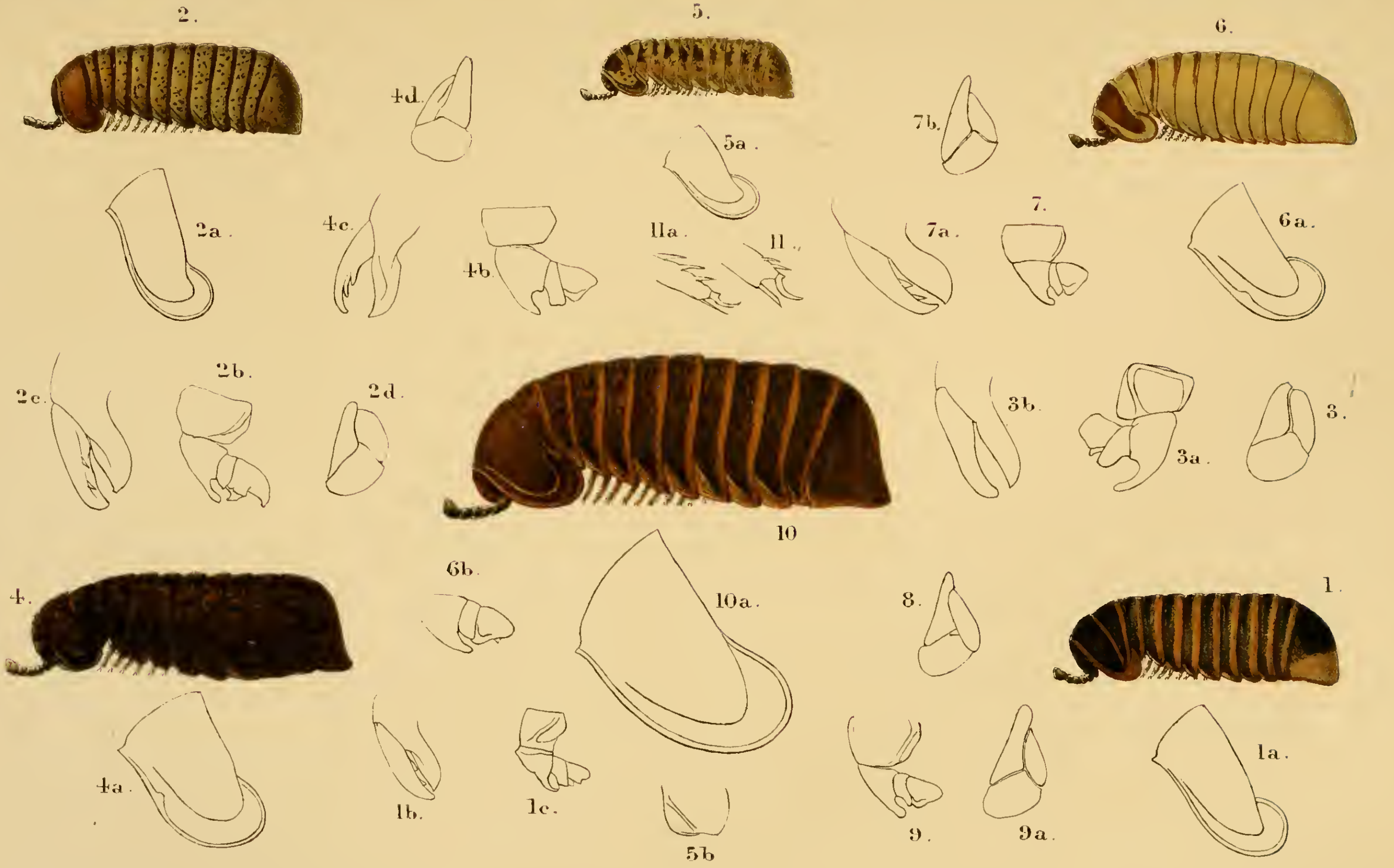
Tergites thickly and closely punctured throughout and clothed with short hairs.

Head and *nuchal-plate* coarsely and more sparsely punctured than the tergites ; nuchal-plate with the sinuate inferior border not marked with a sulcus or fine ridge.

2nd tergite with abruptly sloped, smooth, shining anterior portion, and bearing above this portion an almost obsolete sulcus ; lamina small, originating gradually, and with thickened rounded margin.

Anal tergite (♀) rounded, with small single inner ridge on each side, and a scarcely perceptible marginal notch.

The three basal segments of the *legs* with their inferior edges armed with a series of sharp spines.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3.
10
4.
6b.
10a.
8.
1.
4a.
1b.
1c.
5b
9.
9a.
1a.

J. Green & R. I. Pocock del.

Mintern Bros. lith. London.

INDIAN PILL MILLIPEDES.

Vulva like that of *Z. brandti.*

Length about 19 mm.

Locality.—Ceylon (*R. Templeton*).

This species differs from all yet known in the spinous character of its legs—a character overlooked by Mr. Butler in his description of the type specimen.

Arthrosphæra noticeps (Butler). (Pl. B, figs. 2-2a.)

Syn. *Zephronia noticeps*, Butler, Ann. N. H. (4), X, p. 355 (1872); id., Proc. Zool. Soc. Lond., 1873, p. 179, pl. xix, fig. 4.

Colour pale brownish-green.

Head shining, punctured somewhat sparsely, armed with about three teeth on each side; the ridge that bears these teeth not continuous across the head, but divided in the middle line by a wide excavation.

Nuchal-plate sparsely punctured; inferior border strongly sinuate and with upturned margin; not marked with a fine groove or fine ridge.

2*nd tergite* thickly and very finely punctured, dull; in front smooth and shining; marked close before its front margin with a very faint sulcus, gently rounded off in front and with slightly upturned edge; anterior border evenly rounded from above downwards; the lamina very slightly developed and with thickened margin; the inferior portion of the tergite, above the base of the lamina, faintly ridged.

Tergites thickly and very finely punctured throughout.

Anal tergite (♀) rounded from above downwards and from side to side; punctured like the rest; furnished below in front on its inner surface with a distinct black ridge, behind and below which the edge of the tergite distinctly notched.

Vulva much more quadrate and less elongate than in *A. heterosticta*, more resembling that of *A. versicolor*, but less oval.

Locality.—Ceylon. A single female example without history.

Length about 20 mm.

This species resembles *Z. versicolor* in the sinuate inferior border of the nuchal-plate; but it may easily be distinguished by the evenly arched anterior edge of the first tergite, and by the difference in colour, *A. versicolor* being beautifully marbled with yellow and black.

Arthrosphæra versicolor (White). (Pl. B, figs. 1-1d.)

Syn. *Zephronia versicolor*, White, Ann. N. H. (3), III, p. 405, pl. vii, fig. 3 (1859). Humbert, Mem. Soc. Genève, XVIII, p. 41, pl. iii, fig. 17 (1865) ; Butler, Proc. Zool. Soc. Lond., 1873, p. 181.

This species is so unmistakable on account of its colours that a very few words will suffice to describe it.

Colour marbled, shining black and yellow.

Head and *nuchal-plate* resembling those of *Z. noticeps*.

1*st tergite* smooth above ; rounded off in front ; lamina larger, and rising somewhat abruptly on a level with the eye as a forward expansion of the anterior border.

Tergites smooth behind, punctured in front.

Anal tergite resembling that of *Z. noticeps* in presenting the small ridge and marginal notch.

♂. Anal tergite not saddle-shaped.

Forceps—1st pair differing from those of *Z. brandti* in that the distal segment is distinctly divided into two by a joint which separates a small proximal from a larger distal segment ; the small proximal portion furnished externally with a conspicuous prominence ; the larger distal portion furnished below with a single backwardly directed tooth, and internally at the apex with a second tooth. 2nd pair, with second segment much shorter than in *Z. brandti* ; its dactylar prolongation internally concave and denticulate, its external border evenly convex, its apex slender and curved ; the distal segment less blade-like than in *Z. brandti*, inner surface hollowed and posteriorly denticulated, apex rounded.

Vulva formed on same plan as that of *Z. brandti*, but less elongate, the internal lamina being stouter.

Length 26-40 mm.

Locality.—Ceylon, Peradenia (*Thwaites coll.*).

This species is most nearly related to *Z. noticeps*, but, apart from its coloration, differs from it in the abrupt mode of origin of the lamina of the 1st tergite.

Arthrosphæra Brandti (Humbert).

Sphæropaus Brandti, Humbert, Mem. Soc. Phys., Genève, XVIII, p. 38, pl. iii., fig. 15 (1865) ; Pocock, Journ. Bombay Nat. Hist. Soc., VII., p. 143 (1892).

Zephronia chitonoides, Butler, Ann. Mag. Nat. Hist. (4), X, p. 354, pl. xviii, fig. 2 (1872).

This species, which is of not infrequent occurrence in Ceylon, I have described at some length in the pages of this journal as cited above. It may be without difficulty identified by the key to the species of the genus published below.

The Museum has examples ticketed merely Ceylon (Dr. A. Smith and R. Templeton), and others from Punduloya (E. E. Green). The examples named *Z. chitonoides*, are labelled Madras (Dr. A. Smith) ; but I suspect this is an error for Ceylon.

Arthrosphæra rugulosa (Butler).

Zephronia rugulosa, Butler, Ann. Mag. Nat. Hist. (4), X, p. 355, pl. xviii, fig. 1 (1872).

This species was based upon a small and probably immature specimen from Ceylon (R. Templeton). It seems to differ from *A. Brandti* only in the characters pointed out in the synoptical table (pp. 281, 282).

Arthrosphæra inermis (Humbert).

Sphæropæus inermis, Humbert, Mem. Soc. Phys., Genève, XVIII, p. 37, pl. iii, fig. 17 (1865).

Occurring in Ceylon, Pundaloya, &c. This species seems to differ from the preceding merely in the absence of the tooth-bearing ridge on the back of the head.

The Museum has examples ticketed Ceylon (Templeton), Pundaloya (E. E. Green) ; also examples ticketed Madras (Dr. A. Smith), which, like the specimen of *A. Brandti* mentioned above, are probably erroneously labelled.

Arthrosphæra corrugata (Butler).

Zephronia corrugata, Butler, Ann. Mag. Nat. Hist. (4), X, p. 355, (1872) ; id., Proc. Zool. Soc. Lond., 1873, p. 180, pl. xxi, fig. 8.

Differs form *Z. inermis*, Humbert, in having the second tergite and those that succeed it coarsely sculptured to the posterior border. Perhaps it will prove to be merely a variety of *A. inermis*, in which the extent to which the sculpturing spreads over the tergal plates appears to be variable.

Locality.—Ceylon (*R. Templeton*).

Arthrosphæra heterosticta (Newp.). (Pl. A, figs. 3-3b.)

Zephronia heterosticta, Newport, Ann. Nat. Hist. (1), XIII, p. 265 (1844) ; Pocock, Journ. Bombay Nat. Hist. Soc., VII, p. 145, pl. i, fig. 1 (1892). (Excluding synonymy.)

This species I have also described in this journal as cited above. The type specimen of this species is simply labelled India. But examples sent from Madras by Mr. Thurston appear to be co-specific with it.

Arthorsphœra lutescens (Butler). (Pl. B, figs. 4-4a.)

Zephronia lutescens, Butler, Ann. Mag. Nat. Hist. (4), X, p. 356 (1872); also Proc. Zool. Soc. Lond., 1873, p. 179, pl. xix, fig. 9.

In the Bombay Nat. Hist. Soc., VII, p. 145, 1892, I added this species to the synonymy of *A. heterosticta* of Newport. But until we have more conclusive evidence of the identity of the two forms, it is wiser to regard them as distinct, though the two are undoubtedly closely allied.

There is no locality nearer than India known for the type.

Arthrosphœra atrisparsa (Butler). (Pl. B, fig. 5.)

Zephronia atrisparsa, Butler, Trans. Ent. Soc., 1878, p. 302.

This species also was regarded by myself as identical with *A. heterosticta*, from which, however, it differs in possessing the secondary arched groove on the second tergite, a character in which it resembles *A. lutescens*, of which it will perhaps prove to be the male when freshly preserved and numerous examples come to hand for examination.

Locality.—Bombay District. A single male example.

Arthrosphœra leopardina (Butler).

Zephronia leopardina, Butler, Ann. Mag. Nat. Hist. (4), X, p. 356 (1872); id., Proc. Zool. Soc. Lond., 1873, p. 181, pl. xix, fig. 10.

I previously added this species to the synonymy of *A. inermis*. It may however be recognised from *A. inermis* at least by the presence of the crest on the inner side of the anal tergite. The type specimen is small and possibly immature, and the value that is to be attached to the colouring is, I think, doubtful.

Locality.—Ceylon (*R. Templeton*).

Arthrosphœra marmorata (Butler). (Pl. B, figs. 6-6a.)

Zephronia marmorata, Butler, Ann. Mag. Nat. Hist. (5), IX, p. 197 (1882).

The characters of this species, based upon badly preserved specimens, without record of exact locality in India, are set forth in the subjoined synoptical table of species.

Arthrosphæra zebraica (Butler). (Pl. B, figs. 3-3 a.)

Zephronia zebraica, Butler, Ann. Nat. Hist. (4), X, p. 356, pl. xviii, fig. 4 (1872).

Colour.—Head and nuchal-plate deep blackish-brown, the latter with a narrowly fulvous hinder border; 2nd tergite almost entirely pale yellow, its lamina and front border alone piceous; terga 3 to 10 piceous, with lateral portions and posterior border broadly yellow; anal tergite almost wholely yellow, with a pair of irregularly triangular, brown patches in its upper half.

Head and *nuchal-plate* and 2nd tergite sparsely punctured.

Lamina of 2nd tergite very small, with its margin evenly thickened; rest of the tergites smooth behind, closely punctured in front.

Anal tergite finely punctured throughout, evenly convex, its border not grooved nor notched, the inner crest double, the anterior piece as large as the posterior.

Vulva as in figure.

Length 48 mm. Width 26.

Locality.—Bombay. A single typical ♂ example.

Arthrosphæra Wroughtoni (Pocock). (Pl. A, figs. 1-1c.)

Ann. Mag. Nat. Hist. (6), XVI, p. 411 (1895).

Colour.—Head, nuchal-plate, and second tergite mostly a deep rich blackish-brown; the upper border of the head and the lamina of the 2nd tergite as well as its posterior border reddish-yellow; rest of the tergites deep green, with a pale golden-green band crossing from side to side just in front of the posterior border, which is narrowly black; anal tergite yellow in its lower third, black above, its margin deep brownish-black; antennæ black, with pale sensory area at apex; legs rich reddish-yellow.

Head, *nuchal-plate*, and *2nd tergite* as in *A. zebraica*, but the latter minutely punctulate; the rest of the terga minutely punctulate throughout, but more coarsely so and partially striolate in front; anal tergite evenly convex, its margin grooved, the groove extending on each side from the notch, which with a faint ridge marks the point of fusion of one of the terga with that of the anal segment; the inner crest double, a short anterior piece corresponding with the fused tergite and a longer posterior piece.

Legs rarely with two spines above the claw.

Length about 39 mm. Width about 19.

Locality.—Kanara. A single ♂ example collected by Mr. R. C Wroughton.

Differs from *A. zebraica*, which it somewhat approaches in colour, in being punctulate throughout, in having the margin of the anal tergite grooved, and the posterior half of the inner ridge much longer ; the colours on the 2nd tergite moreover are reversed, the lamina being yellow and the rest black.

Arthrosphœra aurocincta, sp. n. (Pl. A, figs. 10-10a.)

♀. *Colour* an olive-brown or green, mottled or clouded irregularly with black spots ; posterior border of all the tergites marked with a sharply defined brownish-red stripe.

Head and *nuchal-plate* only sparsely punctured, smooth ; 2nd tergite very sparsely and weakly punctured ; its margin evenly thickened throughout ; succeeding tergites coarsely and densely sculptured with punctures in front, with smooth posterior border, the intervening area finely coriaceous ; anal tergite covered all over with a dense sculpturing of coarse anastamosing punctures, with a marginal groove, a small inferior anterior notch and a long double inner crest, the posterior part of which is about twice the length of the anterior.

Vulva of much the same form as in *A. zebraica*, but with the inner skeletal piece longer and surpassing the outer almost as in *A. versicolor*.

♂. With apical antennal segment larger than in ♀, anal tergite slightly saddle-shaped below ; copulatory feet almost as in *A. Wroughtoni*.

Length of ♀ 65 mm. (2½ inches). Width 32 mm.

Locality.—E. Indies (received from the East Indian Museum).

There is unfortunately no definite locality for these specimens. There is little doubt however that they were from some part of India. They are noticeable as being the largest known specimens of the genus.

Arthrosphœra Thurstoni, Pocock. (Pl. A, figs. 2-2d.)

Ann. Mag. Nat. Hist. (6), XVI, p. 411 (1895).

Colour varying from pale olive-green to yellowish-brown ; terga thickly or sparsely spotted with black, with a narrow but distinct black stripe along the posterior border of terga 2 to 12 ; the 2nd tergite and the anal generally of a redder tint than the others ; head and nuchal-plate olive-green or brown; antennæ and legs olive-green; basal segments of the latter pale.

Resembling *A. heterosticta* in structure of head, nuchal-plate, and 2nd tergite, but the margin of the lamina gradually becoming thicker from below up to the level of the eyes, although not abruptly thicker at this point. *Terga* smooth and polished, sparsely marked with shallow punctures, anal tergite entirely smooth, not saddle-shaped, without marginal sulcus, but notch distinct and continued on the inner surface by a fine sulcus which divides the inner crest into two; the anterior portion of the crest short, only as long as the crest on the tergite in front; the part behind it about three times the length.

Vulva with large, nearly semicircular movable digit of first pair of copulatory forceps long and distinctly hooked at the apex (for the rest, see figure).

Length ♀ 34, width 18·5; of ♂ length 27, width 13·5.

Locality.—Nilgiri Hills (*E. Thurston*).

Also four specimens, too badly preserved to be certainly determinable, from Dimhutti, near Kotagiri, Nilghiri Hills, 1,000 feet, and others belonging to this or a closely-allied species from Yercaud in the Sheveroy Hills (*J. R. Henderson*).

This species differs from *A. heterosticta* in many characters, of which not the least striking are those connected with the generative organs. But in addition the margin of the lamina is evenly thickened in *A. heterosticta*, and the crest on the inner border of the anal tergite is represented merely by a single anterior tubercle.

Arthrosphæra Hendersoni (Pocock). (Pl. A, figs. 4-4d.)

Ann. Mag. Nat. Hist. (6), XVI., p. 411 (1895).

♂, ♀. *Colour* deep olive-brown with irregular black blotches over the segments; head and nuchal-plate piceous; antennæ and legs green; basal segments of the latter fulvous.

Head and *nuchal-plate* polished, sparsely punctured; 2nd tergite densely punctured above, smoother in front; lamina small, margin evenly arched, but with a conspicuous nodular thickening opposite the eye; rest of the terga, namely 3 to 10, with hinder border smooth, the rest densely corrugated and punctured, pubescent in front; the inferior angles of the 8th to the 10th considerably thickened and produced both posteriorly and externally.

Anal tergite lightly saddle-shaped in both sexes, without a marginal groove, with a distinct notch; inner crest short, single, and corresponding nearly to the fused tergite defined by the notch. Copulatory feet: first pair with ridge on second segment close to inner edge; basal segment of movable digit produced into a strong quadrate tooth; distal segment deeply grooved below, with a single apical tooth on its posterior surfaces; second pair as in figure.

Length 46 mm.; width 23.

Locality.—Kodaikanal, Palnai Hills, 7,000 feet (*J. R. Henderson*).

Arthrosphæra disticta (Pocock). (Pl. A, figs. 5-5b.)

Ann. Mag. Nat. Hist. (6), XVI., p. 411 (1895).

Colour much like that of *A. heterosticta*; head, antennæ and legs deep green; nuchal-plate with a large double patch of deep green nearly covering it; the rest of the terga a deep olive-yellow, variegated with black spots, and bearing on each side in their anterior half a large irregular black patch; these patches, however, almost absent on the anal tergite.

Head densely punctured below. ***Nuchal-plate*** nearly smooth. 2nd *tergite* with the lamina small, the margin a little thickened opposite the eye, crossed above by a faint arched groove, densely punctulate and pubescent; the crest of the tergite densely and very finely punctulate throughout; covered with fine pubescence. *Anal tergite* evenly convex, its margin not sulcate, weakly notched on each side in front; the inner crest double, its anterior portion longish, twice the length of the posterior portion. *Copulatory feet* very like those of *A. fumosa*, but with the ridge on the second segment of the first pair farther from the inner margin, and the tooth-like projection on the basal segment of the movable digit longer.

Length 26 mm.; width 14.

Locality.—Yercaud, Sheveroy Hills (*J. R. Henderson*).

Arthrosphæra bicolor (Pocock). (Pl. A, figs. 6-6b.)

Ann. Mag. Nat. Hist. (6), XVI, p. 411 (1895).

♂. *Colour.*—Antennæ deep green, head and nuchal plate chestnut-brown, the former ochre-yellow below, pale green above; 2nd tergite mostly chestnut-brown, its anterior portion above, its lateral portion behind; and the lamina, with the exception of its thickened edge, flavous; the rest of the tergites flavous, but the 3rd to 7th with their posterior margins bearing a chestnut stripe which gradually fades away laterally; the extreme inferior angles of the terga and the hinder border of the anal tergite also chestnut-brown.

Legs pale green, with coxa and apices of tarsi yellow.

Head densely punctured below; smooth, like the *nuchal plate*, above. 2nd tergite smooth, punctured in front; lamina small, its margin strongly thickened opposite the eye; the rest of the terga densely punctulate and pubescent throughout, except for the chestnut-brown border on segments 3—7, which is polished.

Anal tergite very slightly saddle-shaped, its edge not sulcate, weakly notched, with only the posterior half of the inner crest developed. *Copulatory feet* much like those of *A. Hendersoni*, but with the tooth of the basal segment of the movable digit of the first pair shorter, and the distal segment longer; the apical tooth farther from the extremity.

Length, 38 mm.; width 21.

Locality.—Salem, Sheveroy Hills (*J. R. Henderson*).

Arthrosphæra Davisoni (Pocock). (Pl. A, figs. 7-7b.)

Ann. Mag. Nat. Hist. (6), XVI, p. 412 (1895).

Colour brown or olivaceous, sometimes mottled with large pale patches, the posterior portion of the tergites a little darker than the anterior; antennæ olivaceous with yellow apical sensory area; legs pale olivaceous, with brightish yellow basal segments.

Head and *nuchal-plate*-polished, the former coarsely and closely punctured below; 2nd tergite finely coriaceous, with distinct punctuation along the anterior and posterior borders; lamina small, its margin strongly and abruptly thickened opposite the eye; the rest of the terga lightly wrinkled in front, finely coriaceous; the middle of the upper surface densely punctured in the middle, less densely in front and behind; some of the segments, *i.e.*, the posterior, pubescent in front.

Anal tergite only very slightly saddle-shaped, densely punctured throughout; the border not sulcate and distinctly or indistinctly notched; the inferior lateral angle marked externally with a distinct pit; the posterior half of the inferior lateral crest very small or absent, the anterior half as long as that upon the preceding tergite.

Generative organs much like those of *A. Hendersoni*; the proximal portion of the vulva smaller as compared with the distal portions, with its angles sharper.

In the first pair of copulatory feet the crest upon the second segment runs along the inner edge, and in the second pair the immovable digit is wider and has no deep notch at its base.

Length of ♀ 31 mm.; of ♂ 22.

Locality.—Coimbatore, Animallai Hills, 4,700 feet (*W. Davison*).

Arthrosphæra fumosa, Pocock. (Pl. A, fig. 8.)

Ann. Mag. Nat. Hist. (6) XVI, p. 412 (1895).

Colour pale olivaceous, the posterior half of the tergites, except of the second and anal, smoky black; head, nuchal-plate, and 2nd tergite piceous, the latter and the rest of the segments mottled with pale blotches and black spots; legs and antennæ deep olive-green, basal segment of former pale.

♀. Resembling *A. Davisoni*, but differing as follows:—Anterior portion of tergites rugose and punctured; posterior portion smooth and highly polished. Second tergite polished, at most minutely punctulate; lamina as in *A. Davidsoni*, but the marginal thickening much smaller. *Anal tergite* densely and closely punctured, with anterior angular pit.

Vulva as in figure.

Length 35 mm.; width 16.

Locality.—Coimbatore, 4,700 feet (*W. Davison*).

Arthrosphæra Dalyi, Pocock. (Pl. A, figs. 9-9a.)

Ann. Nat. Hist. (6), XVI, p. 412 (1895).

Colour a deep olive-brown or green, the posterior border of the tergites sometimes reddish; head, nuchal-plate and 2nd tergite piceous; antennæ and legs green, the former with the two basal segments ochraceous.

Head, *nuchal-plate*, and *2nd tergite* polished, smooth, the first densely punctured below; lamina of second as in *A. Hendersoni*, but the marginal thickening smaller. The other *terga* pubescent and punctulate in front as in *A. Hendersoni*, perfectly smooth and polished in their hinder half; anal tergite punctured and pubescent above; margin not grooved but furnished with a small notch; the inner crest single, and rather longer than that on the tergite in front of it.

Length 36mm., width 29.

Locality.—Lone Cottage, Palnai Hills, 6,000 feet (*J. R. Henderson*); also some smaller (? younger) specimens perhaps of the same species, but more extensively hairy and punctured, from Kodaikanal in the Palnai Hills, 7,000 feet altitude.

Arthrosphæra nitida, sp. n.

Nearly allied to *A. Dalyi.*

A uniform deep olive-green, lightly mottled with paler spots; borders of terga not distinctly redder, *terga* much smoother, only the anterior third of them punctured, the rest exceedingly smooth and polished; *anal tergite* entirely smooth and polished, without marginal notch; the inner crest longer, at least twice the length of the one on the tergite in front, and not bounded behind by a fine vertical groove.

Length 27mm., width 14·5.

Locality.—Kodaikanal, Palnai Hills, 7,000 feet (*J. R. Henderson*).

Key to the Species of Arthrosphæra.

- *a.* Basal segments of legs with strongly toothed inferior edges. (Body punctured and rugose throughout; no teeth on head) ....*pilifera* (Butl.)
- *b.* Basal segments of legs with lower edges not toothed.
  - a^1. A prominent ridge armed with spines running along the top of the head from side to side above the eyes.
    - a^2. Ridge on head mesially interrupted by a downward prolongation of the lower border of the nuchal-plate, which is deeply bisinuate.
      - a^3. Anterior border of second tergal plate strongly produced on a level with the eye; smooth, polished, marbled black and yellow......*versicolor* (White).
      - *b* . Anterior border of 2nd tergite not produced; densely punctured, not polished, dull greenish tint ....*noticeps* (Butl.).
    - b^2. Ridge on head continued from side to side without interruption; lower edge of nuchal-plate scarcely bisinuate.
      - a^4. Anal tergite with a small tuberculiform inner crest; tergal plates including the second punctured and roughened to the very margin *rugulosa* (Butl.).

- *b* . Anal tergite without inner crest ; second tergite and posterior border of the rest smooth *Brandti* (Humb.).
- b^1. Head furnished neither with ridge nor with teeth.
  - a^5. 2nd tergite without an abrupt tuberculiform thickening on a level with the eye.
    - a^6. Anal tergite without an inner lateral, marginal crest.
      - a^7. 2nd tergite and posterior half of the rest smooth and polished...*inermis* (Humb.).
      - b^7. 2nd tergite and the following coarsely sculptured to the posterior margin. *corrugata* (Butl.).
    - b^6. Anal tergite with a conspicuous inner lateral crest.
      - b^8. 2nd tergite with a conspicuous arched groove running behind and parallel to its front border.
        - a^9. Green, marbled with black *atrisparsa* (Butl.).
        - a^9. Green, not marbled with black *lutescens* (Butl.).
      - b^8. 2nd tergite without a conspicuous secondary grove.
        - a^{10}. Body very conspicuously striped yellow and black, a yellow stripe running along the posterior border.
          - a^{11}. 2nd tergite yellow with black anterior border ; anal tergite sparsely punctured, without distinct marginal groove ...*zebraica* (Butl.).

b^{11}. 2nd tergite dark, with yellow hinder border; anal tergite densely punctured and reticulated with marginal groove.

a^{12}. Only the lower edge of the anal tergite narrowly flavous...*auro-cincta*, Poc.

b^{12}. At least the lower third of the anal tergite broadly flavous .... *Wroughtoni*, Poc.

b^{10}. Body spotted, not distinctly striped.

a^{13}. Spots having the form of large irregular blotches.

a^{14}. 2nd tergite and posterior border of the rest smooth and polished......................*leopardina* (Butl.)

b^{14}. 2nd tergite and those succeeding it entirely coriaceous; of large size......... *marmorata* (Butl.).

b^{13}. Spots smaller, irregularly arranged, and black.

a^{15}. Antero-lateral portion of the margin of the lamina of the 2nd tergite thicker than the part above and below it; anal tergite with long posterior crest .... *Thurstoni*, Poc.

b^{15}. Edge of lamina evenly thickened; anal tergite with short posterior crest......*heterosticta* (Newp.)

b^{5}. Margin of 2nd tergite with a large or small but abrupt thickening on a level with the eye; lower edge of anal tergite not grooved.

a^{16}. Mostly pale yellow; 2nd segment chestnut-brown, a stripe of the same colour on the hinder border of segments 3 to 7 ....*bicolor*, Poc.

b^{16}. Colour various, mostly a uniform dark green or brown, often mottled.

a^{17}. Posterior inferior angles of terga 8 to 10 thickened and out-turned; terga densely corrugated; mottled ......*Hendersoni*, Poc.

b^{17}. Posterior inferior angles not thickened and out-turned ; posterior half of terga finely punctured or smooth.

  a^{18}. Colour a deep olive-yellow spotted with black ; a large black patch on each side of the terga ....*disticta*, Poc.

  b^{18}. Colour a deep olive-green or brown, often variegated, but without a large lateral patch on the terga.

    a^{19}. Anal tergite and posterior two-thirds of the others perfectly smooth and polished ; colour deep olive-green, mottled .... *nitida*, Poc.

    b^{19}. Anal tergite punctured throughout or at least above.

      a^{20}. Anterior half of the terga densely pubescent in the adult (terga entirely pubescent in young) *Dalyi*, Poc.

      b^{20}. Terga not pubescent.

        a^{21}. Posterior half of terga (excepting the anal) smooth and polished; anal tergite without impression on its anteriorinferior angle. *fumosa*, Poc.

        b^{21}. Posterior half of terga not polished, dull, punctulate ; anal tergite with a pitlike impression on its anterior inferior angle,......*Davisoni*, Poc.

EXPLANATION OF PLATE A.

Fig. 1	*Arthrosphæra*	*Wroughtoni* :	natural size.
„ 1*a*	„	„	lateral view of second tergite.
„ 1*b*	„	„	posterior forceps of copulatory organ.
„ 1*c*	„	„	anterior forceps of copulatory organ.
„ 2	„	*Thurstoni* :	natural size.
„ 2*a*	„	„	lateral view of 2nd tergite.
„ 2*b*	„	„	anterior forceps of copulatory organ.

Fig.	2c	*Arthrosphæra*	*Thurstoni*:	posterior forceps of copulatory organ.
„	2d	„	„	vulva.
„	3	„	*heterosticta*:	vulva of specimen labelled "Madras."
„	3a	„	„	anterior forceps of copulatory organ.
„	3b	„	„	posterior forceps of copulatory organ.
„	4	„	*Hendersoni*:	natural size.
„	4a	„	„	lateral view of 2nd segment.
„	4b	„	„	anterior forceps of copulatory organ.
„	4c	„	„	posterior forceps of copulatory organ.
„	4d	„	„	vulva.
„	5	„	*disticta*:	natural size.
„	5a	„	„	lateral view of 2nd tergite.
„	5b	„	„	basal segment of anterior forceps.
„	6	„	*bicolor*:	natural size.
„	6a	„	„	lateral view of 2nd tergite.
„	6b	„	*bicolor*:	anterior forceps of copulatory organ.
„	7	„	*Davisoni*:	anterior forceps of copulatory organ.
„	7a	„	„	posterior forceps of copulatory organ.
„	7b	„	„	vulva.
„	8	„	*fumosa*:	vulva.
„	9	„	*Dalyi*:	anterior forceps of copulatory organ
„	9a	„	„	vulva.
„	10	„	*aurocincta*:	natural size.
„	10a	„	„	lateral view of 2nd tergite.
„	11	Apex of the foot in		*Arthrosphæra*.
„	11a	„	„	*Zephronia*.

[*To be continued.*]

Note.—During the passage of this paper through the press, two alleged new species of *Arthrosphæra* have been described by F. Silvestri (Ann. Soc. Ent. Belgique, XLI, pp. 359-360, November, 1897), namely, *Arthrospyæra corrugata* and *A. marginella*. For neither of these species is the locality known; the name given to the first is already in use and must therefore in any case be discarded, and the descriptions of both are not of a nature to make it possible for me to assign to these species their position in the foregoing classification.

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

PART VI.

By C. M. INGLIS.

(*Continued from p.* 481, *Vol. XI.*)

Order *Striges*.

Family *Strigidæ*.

Genus *Strix* (Linn., 1766).

200 *Hume, No.* 60; *Blanf., No.* 1152. STRIX FLAMMEA (Linn.).—The Barn Owl.

I have never shot this species here; but it is found in Silchar, and I dare say will be found in Hylakandy as well.

Subfamily *Buboninæ*.

Genus *Ketupa* (Less., 1831).

201 *Hume, No.* 72; *Blanf., No.* 1164. KETUPA ZEYLONENSIS (Gmel.).—The Brown Fish Owl.

Native name—Dundur pecha.

Not very rare here, its loud cry being often heard at night. It is also, like *Strix flammea*, considered a bird of evil omen by the natives.

Genus *Bubo* (Duméril, 1806).

202 *Hume, No.* 70; *Blanf., No.* 1169. BUBO COROMANDUS (Lath.).—The Dusky Horned Owl.

Fairly common. Often met with in the patches of jungle found near the Bengali busties. It breeds in December. A coolie brought me a young bird of this species which he took from a hollow in a tree. He showed me the place next day; there was practically no lining to it, only a handful of leaves. However I did not examine it very carefully, as it was not very sweet smelling. I kept the young one alive a long time. When any one approached its cage, it would make a clapping noise with its bill and utter a sound like *hoo hoo, hoo hoo,* at the same time bending its head forward and puffing out its neck-feathers. It was very partial to Bulbuls, but would scarcely look at a Myna.

Genus *Scops* (Savigny, 1810).

Hume, No. 75; *Blanf., No.* 1178. SCOPS BAKKAMŒNA (Forst.).—The Collared Scops Owl. 203

The variety found here is *lettia*, and is rather scarce. The only specimens I got were in thin bamboo jungle. It breeds here, as I have found eggs in the oviduct of the female nearly ready for ejection.

Genus *Athene* (Boie, 1822).

Hume, No. 76; *Blanf., No.* 1180. ATHENE BRAMA (Temm.).—The Spotted Owlet. 204

Exceedingly common. They breed here about March in the holes of trees, as many as three or four pairs sometimes in the same tree.

Genus *Glaucidium* (Boie, 1826).

Hume, No. 79; *Blanf., No.* 1183. GLAUCIDIUM CUCULOIDES (Vigors).—The Large-barred Owlet. 205

Rather common. It frequents both thin tree and bamboo jungle. It may be often seen in the day-time perched on a bamboo at the edge of the jungle.

Hume, No. 77; *Blanf., No.* 1184. GLAUCIDIUM RADIATUM (Tick).—The Jungle Owlet. 206

Like the former species, this is also sometimes met with in daylight.

Genus *Ninox* (Hodgs., 1837).

Hume, No. 81 *bis*; *Blanf., No.* 1187. NINOX SCUTULATA (Raffl.).—The Brown Hawk Owl. 207

A rare bird here. I have never heard its cry. The only specimen* got was shot at dusk whilst hawking along the edge of the jungle.

Order *Accipitres.*

Family *Vulturidæ.*

Genus *Otogyps* (Gray, 1841).

Hume, No. 2; *Blanf., No.* 1191. OTOGYPS CALVUS (Scop.).—The Black Vulture. 208

Not very common, but a pair or two are generally to be seen wherever there is a dead carcase.

Native name—Lall or Raj-gidh.

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* "I have two specimens which Mr. Inglis very kindly gave me some years ago; they were amongst a number sent me to identify and which were afterwards made over to me and are now in my collections. (E.C.S.B.)

Genus *Gyps* (Savigny, 1810).

209 *Hume, No.* 4 *ter* ; *Blanf., No.* 1195. GYPS TENUIROSTRIS (Hodgs.).—The Himalayan Long-billed Vulture.

I have never shot this Vulture, but it is, I expect, this species and not *G. indicus* that is found here.*

Genus *Pseudogyps* (Sharpe, 1873).

210 *Hume, No.* 5 ; *Blanf., No.* 1196. PSEUDOGYPS BENGALENSIS (Gmel.).—The Indian White-backed Vulture.

Native name—Gidh. This is our commonest Vulture. They are very quarrelsome, and keep up an incessant noise the whole time whilst feeding.

Family *Falconidæ.*

Genus *Aquila* (Brisson, 1760).

211 *Hume, No.* 29 ; *Blanf., No.* 1203. AQUILA VINDHIANA (Frank.)—The Indian Tawny Eagle.

I have got a single specimen of this Eagle. It is the only one I have ever seen, and must be very rare here. It was shot in December. The plumage is the same as that of *A. fulvescens.*

Genus *Spizætus* (Vicill., 1816).

212 *Hume, No.* 34 ; *Blanf., No.* 1212. SPIZÆTUS LIMNÆTUS (Horsf.).—The Changeable Hawk Eagle.

I have a single specimen, a female, which was shot by one of my men whilst crossing a clearance in the jungle, and kindly identified for me by Mr. Hole.

Genus *Spilornis* (G. R. Gray, 1840).

216 *Hume, No.* 39, *Blanf., No.* 1217. SPILORNIS CHEELA (Lath.).—The Crested Serpent Eagle.

Native name—Mohar. Exceedingly common. A favourite perch of this species is on the top of a dead tree, from which it soars when disturbed, uttering every few minutes its querulous note. I have shot young birds, so expect it breeds here.

Genus *Polioætus* (Kaup., 1847).

214 *Hume, No.* 41 ; *Blanf., No.* 1226. POLIOÆTUS ICHTHYÆTUS (Horsf.).—The Large Grey-headed Fishing Eagle.

Native name—Mach mohar. Fairly common. Generally found either on trees near bheels, or else sitting on a stump in the water watching for fish.

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* 'In this Mr. Inglis is probably right, but no doubt, *G. indicus* is also to be found sometimes in Hylakandy.' (E. C. S. B.)

Genus *Haliastur* (Selby, 1840).

Hume, *No.* 55 ; *Blanf.*, *No.* 1228. HALIASTUR INDUS (Bodd.).—The Brahminy Kite. 215

Common. Frequents marshes and paddy-fields. After a shower of rain numbers congregate to feed on the termites which fly from the ground. They breed here.

Native name—Lall or Sumkur chil.

Genus *Milvus* (Cuvier, 1800).

Hume, *No.* 56 ; *Blanf.*, *No.* 1229. MILVUS GOVINDA (Sykes.).—The Common Pariah Kite. Exceedingly common. 216

Native name—Chil.

Hume, *No.* 56 *bis* ; *Blanf.*, *No.* 1230. MILVUS MELANOTIS (Temm. and Schleg.).—The Large Indian Kite. 217

Only found, I think, during the cold weather. *

Genus *Elanus* (Savigny, 1810).

Hume, *No.* 59 ; *Blanf.*, *No.* 1232. ELANUS CÆRULEUS (Desf.).—The Black-winged Kite. 218

Rather rare. The only one I got was shot whilst hovering like a Kestrel. A few generally seen each year.

Genus *Circus* (Lacépède, 1801).

Hume, *No.* 51 ; *Blanf.*, *No.* 1233. CIRCUS MACRURUS (Gmel.).—The Pale Harrier. 219

Rather scarce. I shot one once flying over the tea in the cold season.

Hume, *No.* 50 ; *Blanf.*, *No.* 1235. CIRCUS CYANEUS (Linn.).—The Hen Harrier. 220

Decidedly rare. I have only seen one since collecting.

Hume, *No.* 53 ; *Blanf.*, *No.* 1236. CIRCUS MELANOLEOCUS (Forst.).—The Pied Harrier. 221

Very common during the cold season, adult males predominating. †

Hume, *No.* 54 ; *Blanf.*, *No.* 1237. CIRCUS ACRUGINOSUS (Linn.).—The Marsh Harrier. 222

Fairly common near the jheels during the cold weather.

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* "This is interesting; the local movements of kites are very peculiar in the hilly portion of the district ; this kite is a permanent inhabitant, whereas *M. govinda* seems to be the Winter visitant." (E. C. S. B.)

† "I think this note may probably be due to an oversight on Mr. Inglis' part. I have collected Harriers very carefully and constantly for twelve years in Cachar and there is no doubt whatsoever that females and non-adult males number at least ten to every adult male. Of course Harriers are not at all easy birds to discriminate, and it is possible that immature males may have been ascribed to other species." (E. C. S. B.)

Genus *Astur* (Lacépède, 1801).

223 *Hume, No.* 23; *Blanf., No.* 1244. ASTUR BADIUS (Gmel.).—The Shikra.

Native name—Shikra.

Very common. I have often snared them and flown them at small birds.

Genus *Accipiter* (Brisson, 1760).

224 *Hume, No.* 24; *Blanf., No.* 1247. ACCIPITER NISUS (Linn.).—The Sparrow Hawk.

Very rare. I have only got a single specimen.

225 *Hume, No.* 25; *Blanf., No.* 1248. ACCIPITER VIRGATUS (Reinw.).—The Besra Sparrow Hawk.

Commoner than the last. I have found it both in the jungle and the open.

Genus *Falco* (Linn., 1766).

226 *Hume, No.* 8; *Blanf., No.* 1254. FALCO PEREGRINUS (Tunst.).—The Peregrine Falcon.

Native name—Bhyri.

Rare here. I have seen it pursue and strike an Imperial Pigeon. Another time some coolies rescued the remains of a Pheasant (*E. horsfieldi*) which this species had killed.

227 *Hume, No.* 14; *Blanf., No.* 1261. FALCO SEVERUS (Horsf.).—The Indian Hobby.

A single specimen shot whilst swooping at something on the ground. They have rather a swift flight.

Genus *Erythropus* (Brehen, 1828).

228 *Hume, No.* 19 *bis*; *Blanf., No.* 1262. ERYTHROPUS AMURENSIS (Gurney).—The Eastern Red-legged Falcon.

Latterly I found this species rather plentiful, flocks passing over my bungalow in the evening. I have several times brought down two or three at one shot whilst roosting. Their flight is rather swift, and much resembles that of *F. severus*.

Genus *Æsalon* (Kaup., 1829).

229 *Hume, No.* 16; *Blanf., No.* 1264. ÆSALON CHICQUERA (Daud.).—The Turumti.

Native name—Turumuti.

Very rare. I have only a single specimen, a female, shot on the wing.

Genus *Tinnunculus* (Vieill., 1807).

Hume, *No.* 17 ; *Blanf.*, *No.* 1265. TINNUNCULUS ALAODARIUS (Linn.).—The Kestrel. 230

Very common. Often seen hovering over grass and paddy lands.

Genus *Microhierax* (Sharpe, 1874).

Hume, *No.* 20 *bis* ; *Blanf.*, *No.* 1268. MICROHIERAX MELANOLEOCUS (Blyth).—The White-legged Falconet. 231

Exceedingly rare. I have only shot a single specimen. *

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* "I have a pair from Hylakandy and lately Mr. Primrose also recorded a pair, I think, from the same part of the district; from their flight, so much resembling that of a Swallow-shrike, I fancy that, though they are decidedly rare anyhow, they are sometimes overlooked." (E. C. S. B.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.

With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,

and

Additions by Sir George F. Hampson, Bart., B.A., F.E.S., &c.

Part V.

(*Continued from page* 42, Vol. XII.)

Family TINÆGERIIDÆ.

Genus Snellenia, Wlsm.

397. *S. coccinea*, Wlsm.

Sikhim, 5,000 feet. (The type of this species, which is now in Lord Walsingham's collection, was taken by me in July below Darjeeling.—*H. J. E.*)

398. *S. tarsella*, Wlsm.

Sikhim. I have not seen a specimen.

Genus Eretmocera, Zell.

400. *E. impactella*, Wlk.

Sikhim and Bhutan, 1,500 feet. I have several specimens which I took during the day at flowers in May and July.

Family SYNTOMIDÆ.

Genus Ceryx, Wllgrn.

401. *C. imaon*, Cram.

Sikhim and Bhutan up to 4,000 feet. This is perhaps the commonest species of the genus within these limits, it occurs from March to September. I have never seen a specimen with a hyaline streak between veins 5 and 6 of the forewing. The darkest form is black with a small triangular hyaline patch in the cell, a similar one below it, two submarginal spots on either side of vein 4, the lower one the smaller, and a small oval spot below vein 7 with a smaller one above it ; the hindwing has the costal margin and the whole outer two-thirds black.

402. *C. godarti*, Boisd.

Sikhim and Bhutan up to 4,000 feet. This occurs with *C. imaon*, and is at once distinguished by the very narrow border of the hindwing.

404. *C. hyalina*, Moore.

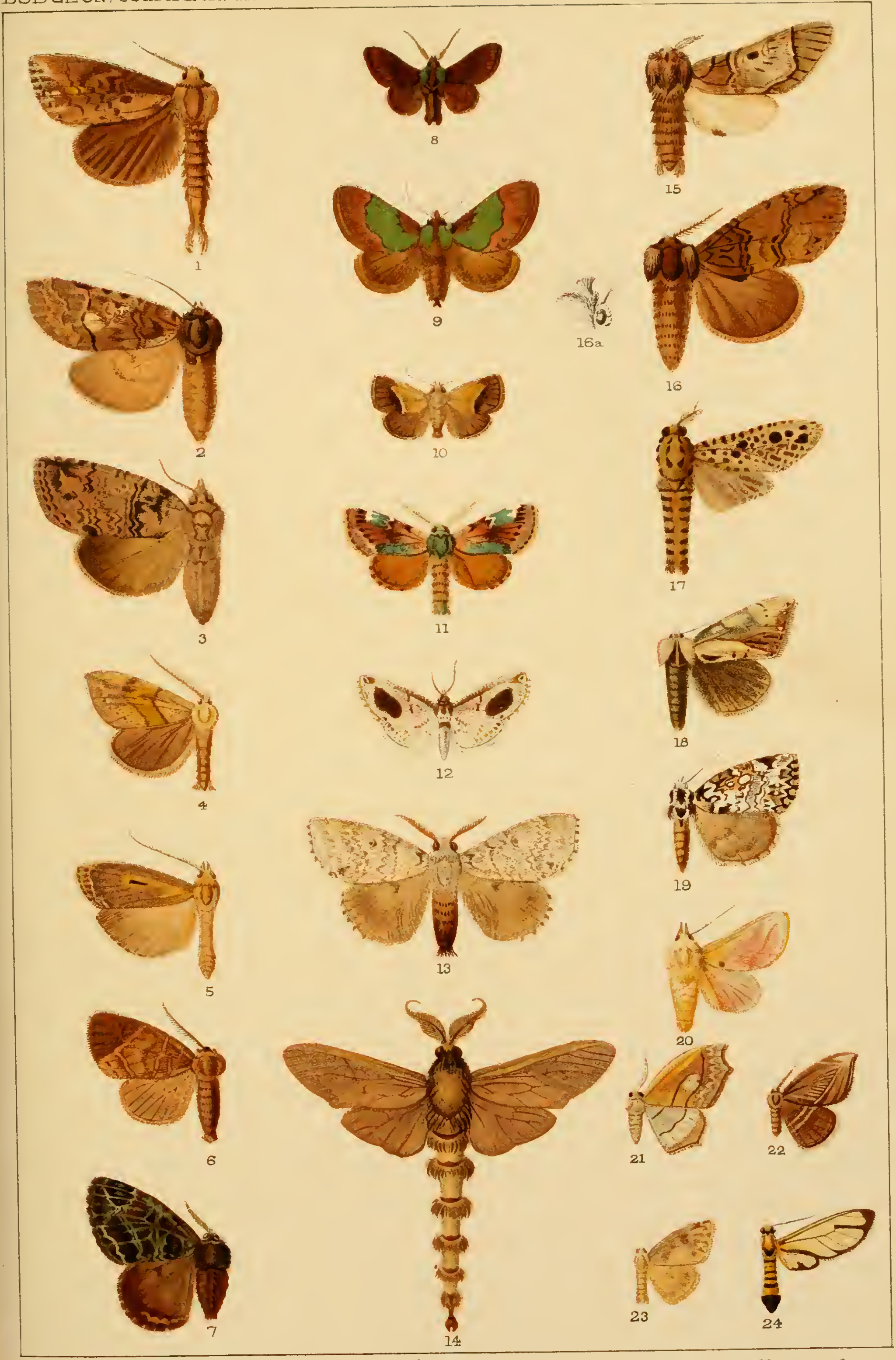
Sikhim (*Hampson*). I have not seen a specimen, nor has Mr. Elwes, from this locality.

HETEROCERA OF SIKHIM AND BHUTAN.

Explanation of Plate I.

Fig. 1. *Pydna albistriga*, Moore, ♂.
" 2. *Phalera bilineata*, Hampson, ♀
" 3. *Gargetta viridigrisea*, n. sp., ♀.
" 4. *Pydna tenebralis*, Hampson, ♂.
" 5. *Gargetta lithosidia*, Hampson, ♂.
" 6. *Ichthyura transecta*, n. sp., ♀.
" 7. *Malachitis melanochlora*, Hampson, ♀.
" 8. *Parasa herbifera*, Walker, ♂.
" 9. *Parasa herbifera*, Walker, ♀.
" 10. *Ceratonema albidivisum*, Hampson, (*ined.*) ♂.
" 11. *Fentonia viridinota*, Hampson, ♂.
" 12. *Rhodoneura argentalis*, Walker, ♂.
" 13. *Dasychira angulata*, Hampson, ♂.
" 14. *Acanthopsyche gigantea*, n. sp., ♂.
" 15. *Pheosia centristicta*, Hampson, ♂.
" 16 & 16*a*. *Hyperœschra trichosticha*, Hampson, ♂.
" 17. *Duomitus pardalis*, n. sp., ♂.
" 18. *Ramesa docilis*, Walker, ♀.
" 19. *Gaurena argentisparsa*, Dudgeon, ♂.
" 20. *Monema coralina*, Dudgeon, ♂.
" 21. *Drepana excisa*, Hampson, ♂.
" 22. *Drepana leucosticta*, Hampson, ♂.
" 23. *Porthesia stigmatifera*, Hampson, ♀.
" 24. *Syntomis compta*, Walker, ♂.

DUDGEON. Journ. Bomb. Nat. Hist. Soc. Pl. I.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West, Newman chromo.

NEW OR LITTLE KNOWN HETEROCERA FROM SIKHIM AND BHUTAN.

Genus SYNTOMIS, Ochsen.

409. S. *unifascia*, Hmpsn.

Sikhim (*Hampson*). I have never received this.

410. *S. sperbia*, Fabr., Mant. Mo., 2, p. 103 (1787).

S. atkinsoni, Moore (syn).

Sikhim and Bhutan, 2,500 feet to 3,000 feet. This is not uncommon in May and September. (Taken by Möller in the Terai in June.—*H. J. E.*)

411. *S. bicincta*, Koll.

Sikhim, 1,800 feet. I have three specimens taken in May and July; it is rather rare. Mr. Elwes records it as occurring rarely in April at about 5,000 feet.

412. *S. cyssea*, Stoll.

Sikhim. I have never seen a specimen from this locality. (Rare in April at low elevations.—*H. J. E.*)

419. *S. lucina*, Butl.

Sikhim and Bhutan, 4,500 to 5,000 feet. This is extremely common in May and September at Kurseong, Tukvar, and Gangtok.

423. *S. divisa*, Wlk.

Sikhim. (Not uncommon at low elevations in April.—*H. J. E.*)

426. *S. melæna*, Wlk.

Sikhim, 5,000 feet. Occurs in August. The male has seven yellow bands on the abdomen, and the female only six buff ones.

429*a*. *S. compta*, Wlk. (PLATE I, FIG. 24.)

Bhutan, 1,500 feet. I described this species under the name of *S. ceratina*, but Sir George Hampson writes that he has examined the type of *S. compta*, Wlk., in the Exeter Museum and finds that my specimen is referable to it. Differs from *S. fervida*, Wlk., in the abdominal bands being complete and broad, the terminal segment indigo blue and rather thicker than the others. Forewing yellowish hyaline with a dark yellow band along the costa and another submarginal to the inner margin; veins 5 and 6 joined by a black band between them. Hindwing with the inner margin dark yellow. Legs with the femora yellow, tibia blue-black, and the first joint of the tarsi white. This seems intermediate between *S. fervida* and *S. newara*, neither of which I have seen. *Exp.* 33 millimetres.

430. *S. newara*, Moore.

Sikhim and Bhutan. (A specimen in Möller's collection was taken in Bhutan in September.—*H. J. E.*)

435. *S. submarginalis*, Wlk.

Sikhim and Bhutan, 1,800 to 2,500 feet. Occurs in September and October. (Taken in April and May.—*H. J. E.*)

Genus Eressa, Wlk.

431. *E. lepcha*, Moore.

Sikhim. (A single specimen from Möller's collection.—*H. J. E.*)

446. *E. multigutta*, Wlk.

Sikhim, 5,000 feet. Four specimens taken at Tukvar in May, 1887. Hampson makes *E. blanchardi*, Pouj., a synonym of this species.

450. *E. aperiens*, Wlk.

Bhutan, 1,200 feet. I took a single male of this species in Aug., 1894.

455. *E. confinis*, Wlk.

Sikhim and Bhutan, 1,800 to 2,500 feet. I have seven specimens taken in May, July, August and November, in three specimens the hindwing is entirely black.

Genus Callitomis, Butl.

464. *C. multifasciata*, Hmpsn.

Sikhim. (The only specimen I have seen from Sikhim was from Colonel Swinhoe's collection and marked "Sikhim, Möwis." I do not consider this at all a reliable authority.—*H. J. E.*)

Genus Trichæta, Swinh.

465. *T. teneiformis*, Wlk.

Sikhim. The only specimen I have seen was one from this locality from my collection, now in the British Museum.

Family ZYGÆNIDÆ.

Subfamily Zygæninæ.

Genus Chrysartona, Swinh.

477. *C. stipata*, Wlk.

Sikhim. I only obtained one specimen of this through my collectors taken in August.

Genus Artona, Wlk.

482. *A. postvitta*, Moore.

Sikhim. (A very rare species. Taken in Darjeeling in March.—*H. J. E.*)

483. *A. postalba*, Elwes.

Sikhim. (A single specimen only taken on the Nepal frontier at 12,000 feet in July.—*H. J. E.*)

485. *A. zebraica*, Butl.

Sikhim and Bhutan, at 3,000 feet. Common from May to July. It is a variable species in the colour of the abdomen.

486. *A. zebra*, Elwes.

Sikhim. (Taken in the same locality as *A. postvitta*. Two specimens only.—*H. J. E.*)

487. *A. sikkimensis*, Elwes.

Sikhim. (One specimen only taken at the same time and place as the last two. These three species are allied to *A. zebraica*, but seem perfectly distinct.—*H. J. E.*)

488. *A. confusa*, Butl.

Sikhim, 5,500 feet. I have only taken a single specimen of this at Tukvar in May.

Genus Lophosoma, Swinh.

493. *L. cupreum*, Wlk.

Sikhim and Bhutan, 1,800 feet. This occurs rarely in the outer hills in July.

Genus Clelea, Wlk.

498. *C. sapphirina*, Wlk.

Sikhim and Bhutan, 1,000 to 5,000 feet. I have taken this in May, June and July.

499. *C. discriminis*, Swinh.

Sikhim. (Taken in June in the interior.—*H. J. E.*)

501. *C. plumbeola*, Hmpsn.

Bhutan, 6,700, feet. I found this extremely common at light at Rissoom and Pashiteng in September. My specimens were identified by Sir George Hampson, but the plumbeous bands mentioned in his description are not plainly visible in my specimens. I have another specimen which I took at 5,500 feet in June, 1888, which was identified by Mr. Moore as *Tasema fuliginosa*, Moore; this is not in good condition now.

Genus Phacusa, Wlk.

503. *P. properta*, Swinh.

Sikhim and Bhutan, 1,500 to 2,500 feet. I have two males and three females, which I took at Fagoo and Punkabaree in May.

506. *P. khasiana*, Moore.

Sikhim, 1,800 feet. I took a single male at Potong in May, and saw two or three others in the same month.

Genus PLATYZYGÆNA, Swinh.

511. *P. mölleri*, Elwes.

Sikhim. (This must be a very local species as it has only been obtained by Möller's collectors on one occasion.—*H. J. E.*)

Genus ARÆOCERA, Hmpsn.

513. *A. posthyalina*, Hmpsn.

Sikhim. (I have only two specimens taken in April by Möller's collectors.—*H. J. E.*)

Genus ARACHOTIA, Moore.

514. *A. flaviplaga*, Moore.

Sikhim. I have only one specimen without intimation of date or elevation.

Subfamily CHALCOSIINÆ.

Genus TRYPANOPHORA, Koll.

519. *T. semihyalina*, Koll.

Sikhim and Bhutan, 1,800 to 2,000 feet. This is a common species at low elevations. I have often seen both sexes settled on the leaves of *Cedrela toona* and other trees. It is easily taken. It occurs in January, March, June and July.

Genus PHLEBOHECTA, Hmpsn.

522. *P. fuscescens*, Moore.

Sikhim and Bhutan. My only specimen, a male, was obtained in the latter locality in June.

523. *P. flavicosta*, Elwes.

Sikhim. I have not taken this species.

Genus SORITIA, Wlk.

524. *S. rubrivitta*, Wlk.

Sikhim. This must be very rare in this locality. I have never seen a specimen.

525. *S. leptalina*, Koll.

Sikhim and Bhutan, 4,000 to 5,000 feet. This is an extremely common species at this elevation, and both sexes show considerable variation. The hindwings in both sexes may be deep ochre or white, those of the males with broad marginal bands. The larva is yellow-brown with lateral and dorsal narrow black lines, and feeds on rose and tea bushes besides the leaves of *Polygonum nepalense* and other plants. The perfect insect occurs in April, May, August and October.

526. *S. shahama*, Moore.

Sikhim. Not procured by me.

527. *S. bicolor*, Moore.

Sikhim. I have one female which was taken at about 4,000 feet in October.

528. *S. nigribasalis*, Hmpsn.

Sikhim. One male taken in June, 1888.

529. *S. circinata*, Herr.-Schäff.

Sikhim, 5,000 feet. This occurs rather rarely in October.

Genus PIDORUS, Wlk.

531. *P. circumdatus*, Wlk.

Sikhim. One specimen taken in July. (Rare in Sikhim at low elevations in May.—*H. J. E.*)

532. *P. geminus*, Wlk.

Sikhim and Bhutan, 7,000 feet. The Bhutan specimen has the band on the forewing yellow, and the Sikhim one, which was taken in Darjeeling in May, paler yellow.

535. *P. glaucopis*, Drury.

Sikhim and Bhutan, 1,000 to 5,000 feet. The width of the band on the forewing is variable. I have taken it in May, June, and July chiefly at about 2,500 feet elevation.

536. *P. miles*, Butler.

Sikhim and Bhutan. I have only one specimen from Bhutan taken in May. (Rare in Sikhim, my only specimens are dated September.—*H. J. E.*)

Genus ARBUDAS, Moore.

541. *A. bicolor*, Moore.

Sikhim and Bhutan. Rare in the latter locality in September.

Genus HERPA, Wlk.

543. *H. subhyalina*, Moore.

Sikhim. I have never seen this species. (I believe that the types of this species in the Atkinson Collection were taken by myself in 1870 in the Lachoong Valley at about 6,000 feet in September, but at that time I had no collection of insects and I have never seen the species since.—*H. J. E.*)

Genus PINTA, Wlk.

545. *P. ferrea*, Wlk.

Sikhim. Occurs at Sivoke in March at about 1,000 feet. (Common in March and April at 2,500 feet.—*H. J. E.*)

Genus HETERUSIA, Hope.

548. *H. raja*, Moore.

Sikhim, 5,000 feet. I took ten specimens in September at Tukvar in 1887 but have never seen a specimen since.

549. *H. alompra*, Moore.

Sikhim and Bhutan. I have not seen this. (The only specimens from Sikhim I have seen are in my own collection, one of them was obtained by Mr. Lister in British Bhutan at about 2,000 feet. Sir George Hampson has united with this species, of which I have a typical specimen from Sibsagar, *H. urania*, Schaus., which is a Sikhim form of *H. submarginalis*, Swinhœ, which I have from the Ruby Mine district, Upper Burma. As they stand in my collection they are easily separable as species, but it is quite probable that intermediate forms may occur which will connect them.—*H. J. E.*)

550. *H. lativitta*, Moore.

Sikhim. (A rare species which I have from Möller's collection.—*H. J. E.*)

551. *H. tricolor*, Hope.

Sikhim and Bhutan, 3,000 to 5,000 feet. Three specimens in my collection were taken by me at Tukvar and two in Bhutan. The larva is very similar to that of *Soritia leptalina*, Koll., but differs in being duller brown and without the black lateral and dorsal lines; the pupa is formed in the usual cocoon made of a papery covering over the hollow of a leaf. The perfect insects are found on the wing in March, May, June, August and September. The male has black segmental bands on all but the second abdominal segment.

552. *H. edocla*, Doubl.

Sikhim and Bhutan, 1,000 to 5,000 feet. The larva is found commonly on tea and other plants, it differs very slightly from that of *H. tricolor*, Hope. The perfect insect is found from March until August or September. I have one specimen with the submarginal band of spots on the forewing wanting. (Occurs commonly at about 2,000 to 4,000 feet. I have small specimens taken as late as the end of November.—*H. J. E.*)

553. *H. magnifica*, Butl.

Sikhim and Bhutan, 1,000 to 4,000 feet. This occurs all through the year, and is found with *H. edocla*, Doubl. I have one male with the band on the hindwing white which compares well with Butler's figure of *H. virescens*, Butl., but I do not think it can be other than a variety of *H. magnifica*, Butl.

Genus MILLERIA, Herr.-Schäff.

558. *M. virginalis*, Herr.-Schäff.

Sikhim and Bhutan. I have four taken in April in the latter locality, one of which is the variety *fuliginosa*, but without the inner area of the hindwing yellow, and with the basal third of the hindwing and all the veins shot with blue; the next two are a male and female almost exactly alike, having the submarginal band slightly more pronounced than that of the specimen figured by Hampson; the fourth is a female with no trace of any bands whatever on either wing, the veins on the forewing being slightly defined with fuscous and those of the hindwing pale blue. Mr. Elwes says he is not at all sure whether *M. fuliginosa*, Wlk., is not a distinct species. I am inclined to think that the species is a very variable one, and that Sir George Hampson is right in including it only as a variety.

561. *M. cardinalis*, Moore.

Sikhim. I have not seen a specimen. Mr. Elwes thinks that from the description it might be a small variety of *M. virginalis* (var. *fuliginosa*).

Genus CHALCOSIA, Hübn.

564. *C. argentata*, Moore.

Sikhim. (I have a small specimen of this from Möller's collection taken in March, but it is evidently very rare in Sikhim. It occurs at Ranchi in Western Bengal and also in Burma near the Ruby Mines.—*H. J. E.*)

568. *C. corusca*, Boisd.

Sikhim and Bhutan, 3,000 to 4,500 feet. This is a common species in May, July and September.

569. *C. thallo*, Linn.

Sikhim. I have one specimen without date received through my collectors.

Genus Corma, Wlk.

573. *C. maculata*, Hmpsn.

Bhutan, 2,500 feet. I took one specimen at light in July at Fagoo. It is a male, and the abdomen is yellow with black spots.

Genus Cyclosia, Hübn.

577. *C. papilionaris*, Drury.

Sikhim and Bhutan, 1,000 to 3,000 feet. This is a variable species in size and the extent of blue to be found on the forewing. In one specimen the costa is light blue, and there is a submarginal band of eight light blue quadrate spots to the forewing, and a similar band of eight to the hindwing. It occurs from May to September.

579. *C. panthora*, Cram.

Sikhim and Bhutan, 1,000 feet. I have five specimens from Sivoke which show no variation.

Genus Amesia, Duncan.

582. *A. sanguiflua*, Drury.

Sikhim and Bhutan, 3,000 to 4,500 feet. Is found not uncommonly in May, June and August.

583. *A. aliris*, Doubl.

Sikhim and Bhutan. This is found with the preceding species but is not so common.

584. *A. hyala*, Druce.

Sikhim. I have never seen a specimen.

Genus Erasmia, Hope.

585. *E. pulchella*, Hope.

Sikhim and Bhutan, from 2,500 to 4,000 feet. This is extremely common in May between Bamesbeg and Singla in the Rungeet Valley. I have taken it less commonly at 3,000 feet in Bhutan. The larva is velvety-black with pink tubercles, and a rectangular pale yellow dorsal patch covering two somites. It feeds on a plant generally known as wild coffee. The pupa is formed on the surface of a leaf in a papery cocoon. (Common at Kalimpong in September and October; I have taken it also in December, and as low as 1,000 feet.—*H. J. E.*)

Genus CAMPLYOTES, Westw.

586. *C. histrionicus*, Westw.

Sikhim, 3,000 to 5,000 feet (*histrionicus*, 2 forms) ; Sikhim and Bhutan, 9,000 to 10,000 feet. (*sikhimensis*, 2 forms). Of the two forms of *histrionicus*, one has the red markings on both wings pronounced and bright, the other having them pale and dull. I think that *sikhimensis*, Elwes, is a good species and I have never seen intermediate forms. Mr. Elwes records *histrionicus*, var. *altissima* from 10,000 feet, which seems to me to show that *sikhimensis*, which also occurs there, is not a mere high elevation form of *histrionicus*. Sir George Hampson also includes a var. *excelsa*, Oberthür, which I have not seen. (*C. sikhimensis*, *C. altissima* and *C. excelsa* I continue to regard as good species as I have seen no specimens from Sikhim or elsewhere which are intermediate between either of these forms and *C. histrionicus*, and as they appear to be confined to much higher altitudes.—*H. J. E.*)

588. *C. atkinsoni*, Moore.

Sikhim, 8,000 feet. May. (This species seems to be local but common where it occurs, which, as far as I know, is only in the interior of Sikhim.—*H. J. E.*)

Genus CADPHISES, Moore.

589. *C. maculata*, Moore.

Sikhim. I have only seen two specimens of this species in Dr. Pilcher's collection. It seems to me to be quite distinct from the next species, the inner margin of the hindwing being yellow or buff, unmarked with white spots.

590. *C. moorei*, Butl.

Sikhim and Bhutan. I have only one male from Bhutan, which is easily distinguishable from the two specimens of *C. maculata* I have seen, in that the spots are fewer, round and obsolescent towards the outer margins, the inner margin of the hindwing is spotted with white, and the ground-colour is brownish-fuscous.

Genus ISBARTA, Wlk.

592. *I. imitans*, Butl.

Sikhim and Bhutan. Occurs at low elevations in the hot valleys of the larger rivers in April and May.

Genus Callamesia, Butl.

594. *C. midama*, Herr.-Schäff.

Sikhim and Bhutan. This species I have taken commonly at Fagoo, 2,500 feet, in British Bhutan. The female is more often seen than the male, I think, and when flying is easily mistaken for that sex of *Euplœa linnœi*, Moore. It occurs from May to August.

Genus Gynautocera, Guér.

595. *G. papilionaria*, Guér.

Sikhim and Bhutan, at 2,500 feet. Common in June and July. (I have taken this at Kalimpong at 4,000 to 5,000 feet in August.—*H.J.E.*)

Genus Histia, Hübn.

596. *H. flabellicornis*, Fabr.

Sikhim and Bhutan, 1,000 to 3,000 feet. This occurs commonly at Sivoke and the lower portions of Badamtam in the Rungeet and Teesta Valleys. My specimens were taken from May to August. I have found the larvæ at 2,000 feet feeding on the leaves of tree called locally "*Kainjel.*" It is brown with pink lateral tubercles.

Genus Canerces, Moore.

600. *C. euschemoides*, Moore.

Sikhim. One specimen obtained by my collectors in March, it is distinctly scarce, and I have never seen another specimen.

Genus Philopator, Moore.

601. *P. basimaculata*, Moore.

Sikhim. The female of this species has the wings much shorter and rounder than those of the male. (Not uncommon at 3,000 to 4,000 feet in May.—*H. J. E.*)

601 *a*. *P. rotunda*, Hmpsn.

Sikhim. This species, which I have not seen, seems to be near the last but with even shorter wings. The sex described is not stated so that it must be taken that both sexes have shorter and rounder wings than those of *P. basimaculata*, Moore. (This species seems to be commoner in the Naga and Khasia Hills than in Sikhim, from whence I have only one female.—*H. J. E.*)

Genus Agalope, Wlk.

602. *A. hyalina*, Koll.

Sikhim and Bhutan, 2,000 to 5,000 feet. I have taken this at 2,000 feet in Bhutan in January and May, and at 5,000 feet in Sikhim in July.

(Occurs at 7,000 to 9,000 feet, where it is not uncommon in May and June.—*H. J. E.*)

Genus ACHELURA.

603. *A. bifasciata*, Hope.

Sikhim and Bhutan, 1,800 to 4,500 feet. This species seems to fly more than other species of the genus. I have constantly remarked it at Punkabaree flying out of reach in company with *Delias*, and I have only managed to take it on one occasion.

604. *A. eronioides*, Moore.

Sikhim. I have never seen this. (Apparently very rare in Sikhim. I have only one from Lidderdale's collection.—*H. J. E.*)

605. *A. basiflava*, Moore.

Sikhim. I have not seen this species either.

606. *A. glacialis*, Moore.

Sikhim. I have one specimen which I took in May at 3,000 feet. It must be rare as I have never seen another.

Sub family PHAUDINÆ.

Genus PHAUDA, Wlk.

611. *P. flammans*, Wlk.

Sikhim. Rare at 5,000 feet. I have one specimen which has the fuscous patch on the outer margins of the forewing and hindwing suffused with reddish, and the scarlet of the forewing replaced by dull reddish. It is probably only a variety and not distinct.

612. *P. fuscalis*, Swinh.

Sikhim. My only specimen is in the British Museum collection.

A species of the genus HIMANTOPTERUS is recorded to have been taken at Punkabaree by Mr. Farr. This is said by Mr. Moore to have been No. 614, *H. caudatus*, Moore. It must be extremely rare if found within these limits, as it has not again been procured.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART V.

By Sir G. F. Hampson, Bart., F.Z.S., F.R.S.

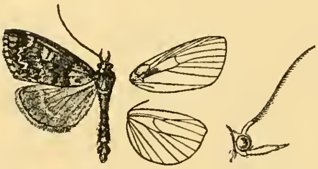
(*Continued from page 98 in this Vol.*)

Genus Megarthria.

Megarthria, Hmpsn., Rom. Mem., viii., ined.

Type.—*M. velutineila*, Hmpsn.

Range.—Assam.



Megarthria velutinella. ♂, $\frac{1}{1}$

Proboscis short; palpi straight, porrect, the 2nd joint extending about twice the length of head and moderately hairy, the 3rd well developed; maxillary palpi small and filiform; frons rounded; antennæ with the 1st joint very long and curved, the shaft strongly pubescent. Forewing with the costa moderately arched, the apex rectangular; vein 3 from well before angle of cell; 4, 5 very shortly stalked; the discocellulars curved; 6 from upper angle; 7, 8, 9 stalked; 10, 11 from cell: male with a glandular swelling at base of costa below fringed with hair met by a tuft of hair from below median nervure; the retinaculum bar-shaped and hairy. Hindwing with vein 3 from close to angle of cell; 4, 5 very shortly stalked; the discocellulars curved; 6, 7 stalked, 7 anastomosing very slightly with 8.

4152*b*. Megarthria velutinella, Hmpsn., Rom. Mem., viii, ined., pl. 53, f. 12.

Head and thorax blackish-brown with a fulvous patch on collar; abdomen brownish. Forewing purplish-brown irrorated with black scales; the base, costa, and veins of outer area strongly tinged with ferruginous-red; the antemedial line diffused blackish, curved and bent inwards to costa, with a similar line beyond it; a red discocellular mark with a blackish lunule on it; the postmedial line regularly dentate and obliquely curved from costa to vein 4, where it is obtusely angled; an evenly dentate submarginal dark line and a series of large marginal black points; cilia fulvous. Hindwing fuscous with a yellowish tinge; cilia fulvous, underside with indistinct dentate postmedial line.

Habitat.—Khásis. *Exp.* 28 mm.

4156*a*. CRAMBUS CORTICELLUS, n. sp.

♂. Head and thorax dark and golden-brown; abdomen fuscous. Forewing coppery golden-brown, the veins and interno-median fold irrorated with white scales; the costal area suffused with blackish; a black point in end of cell; a marginal series of black points surrounded by white scales; cilia paler. Hindwing fuscous-grey. ♀. With the ground-colour uniform dull brown; hindwing grey-brown.

Habitat.—Khásis; Calcutta. *Exp.* ♂ 24, ♀ 40 mm. *Type*—♂ in British Museum; ♀ in coll. Rothschild.

4159. CRAMBUS PARVELLUS=4178, *C. ochristrigellus*.

4202*a*. CHILO STENIELLUS, n. sp.

♂. Head and thorax pale grey-brown; abdomen whitish, dorsally ochreous towards base. Forewing long and narrow; pale grey-brown irrorated with fuscous and suffused with fuscous in the interspaces, especially the cell and discal fold, leaving the veins slightly paler; traces of two very oblique lines from below apex to middle of inner margin; a marginal series of black points. Hindwing pure white.

Habitat.—Tezpore, Assam. *Exp.* 30 mm. *Type*—In coll. Rothschild.

Genus DIATRÆA.

Diatræa, Lands. Guild. Trans. Soc. Encom. Arts, xlvi, 143 (1832).

Type.—*D. saccharalis*, Fabr.

Range.—Nearctic and Neotropical regions; Mauritius; Ceylon; Borneo; Java.

Palpi extending about three times the length of head and thickly clothed with hair; maxillary palpi triangularly dilated with hair; proboscis absent; frons with a tuft of hair; antennæ of male minutely serrate and fasciculate; tibiæ somewhat hairy, the spurs well developed. Forewing with the apex somewhat acute; vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from near upper angle; 8, 9 stalked; 10 free; 11 anastomosing with 12. Hindwing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

4202*a*. DIATRÆA SACCHARALIS, Fabr., Ent. Syst., iii, 2, 238.

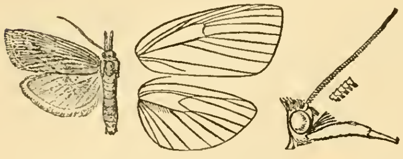
Chilo obliteratellus, Zell., Mon. Chil. and Cramb., p. 8.

Crambus leucaniellus, Wlk., Cat., xxvii, p. 161.

„ *lineosellus*, Wlk., Cat., xxvii, p. 162.

Chilo companellus, Feld., Reis. Nov., pl. 137, f. 5.

„ *crambidoides*, Grote, Can. Ent., xii, p. 15.



Diatræa saccharalis, ♂ $\frac{1}{1}$

♂. Head and thorax ochreous-brown; abdomen whitish with fulvous band on 1st two segments. Forewing ochreous; the veins and interspaces streaked with fuscous; a black speck on discocellulars; an obscure dark minutely dentate line from costa near apex to inner margin before middle; a similar but more prominent line from the same point on costa to inner margin half-way between 1st line and outer angle; a marginal series of black specks. Hindwing whitish, slightly ochreous towards outer margin, and often with a marginal series of black specks. ♀. Paler and clearer ochreous; the hindwing almost pure white.

The larva bores in the sugarcanes, and is very destructive.

Habitat.—N. and S. America; W. Indies; Ceylon. *Exp.* ♂ 22, 28; ♀ 28, 40 mm.

4218*a*. MESOLIA RECTILINEELLA, n. sp.

♀. Dark reddish-brown irrorated with fuscous. Forewing with the apical area slightly produced; fine black streaks below basal half of costa and median nervure, the latter continued as a black and white streak below vein 2; no trace of antemedial line; a white spot with curved black streak below it, and black point beyond it at upper angle of cell; a white submarginal line curved below costa, then straight and oblique; a white-edged black subapical spot with similar speck below it; fine black streaks on extremities of median veins crossing a white line; a black line through base of cilia, which are whitish. Hindwing dark fuscous; cilia whitish with a fuscous line through them.

Habitat.—Ajmere, Punjab. *Exp.* 16 mm. *Type*—In coll. Rothschild.

4218*b*. MESOLIA MARGISTRIGELLA, n. sp.

♂. Forewing with vein 3 from before angle of cell; 4, 5 from angle; 7 absent; the apical area slightly produced; antennæ serrate. Head and thorax ochreous-brown; antennæ blackish; abdomen grey. Forewing pale ochreous-brown suffused with white and irrorated with black scales, except on costal and marginal areas; the black scales forming a diffused patch below middle of cell, a spot on vein 2 and a streak in end of cell ending in a discocellular spot; an indistinct submarginal white line angled sharply outwards on vein 6 and inwards on vein 2; a marginal series of short black vittæ on whitish marks; cilia whitish, with a fine brown line through them. Hindwing pale fuscous; cilia white with a fuscous line through them.

Habitat.—Ajmere, Punjab. *Exp.* ♂ 18 mm. *Type*—In coll. Rothschild.

4255*a*. PATISSA INTERFUSCALIS, n. sp.

♀. White, palpi black at sides; thorax and abdomen tinged with brown. Forewing with rather broad black costal fascia, tapering to apex; all the interspaces broadly striped with fuscous-brown. Palpi slightly extending beyond the frons.

Habitat.—Tezpore, Assam. *Exp.* 30 mm. *Type*—In coll. Rothschild.

4256*a*. PATISSA ÆNEALIS, n. sp.

♂. Head, thorax and abdomen white, slightly tinged with golden-brown. Forewing white, the cell and area below it suffused with golden-brown; the costal area golden-brown; an oblique blackish line with a golden-brown band on its outer edge from costa near apex bent inwards at vein 3 and reaching inner margin at middle. Hindwing silvery-white; both wings with a blackish line just inside the margin, and very fine marginal line.

Habitat.—Dimbula, Ceylon (Pole). *Exp.* 24 mm. *Type.*—In British Museum.

P. 52. For *Menuthia* insert TINERASTIA, Hmpsn., Rom. Mem., viii, ined.

For *Calera* insert MESODIPHLEBIA, Zell., Hor. Ent. Ross, xvi, p. 251 (1881).

Type.—*M. crassivenia*, Zell., from Colombia.

4281. HYPSOTROPHA HETEROCERELLA. Antennæ of type with the medial branches eaten off by some insect.

4282. HYPSOTROPHA LATERCULELLA. Maxillary palpi of ♂ filiform; antennæ laminate with sinus and tuft.

4282*a*. HYPSOTROPHA QUADRIPUNCTELLA, Rag., Rom. Mem., viii ined., pl. 39, f. 16.

♀. Head and thorax pinkish-brown; abdomen paler, dorsally ochreous towards base. Forewing pinkish-brown; the veins pale; an antemedial black point on vein 1, postmedial points on veins 6, 3, and

1; cilia black-brown. Hindwing white or pale brownish, darker towards costa; a fine dark marginal line.

Habitat.—Ceylon; Pulo Laut; Borneo; Tenimber. *Exp.* 14-20 mm.

4283. HYPSOTROPHA TENUINERVELLA. Palpi of ♂ hollowed out to receive the maxillary palpi; antennæ laminate with sinus and tuft.

P. 55. Under **Anerastia**, insert *Ampycodes*, Rag., Rom. Mem., viii, ined., for Sect. II, A.

4292*a*. PATNA TRICOLORELLA, Hmpsn., Rom. Mem., viii, ined., pl. 52, f. 15.

♂. Antennæ serrate, with sinus and tuft at base. Palpi blackish, antennæ ochreous, vertex of head and thorax red, abdomen ochreous. Forewing with whitish costal fascia narrowing to base and apex, irrorated with purplish-fuscous scales and becoming purplish-fuscous at costa, defined below by a broad purplish-fuscous fascia narrowing to apex, the veins and interspaces of outer area streaked with fuscous; inner area bright crimson-red. Hindwing yellowish suffused with fuscous, especially towards costa and outer margin.

Habitat.—Khásis. *Exp.* 24 mm.

P. 58. For *Poujadia* insert SALURIA, Rag., Ann. Soc. Ent. Fr. (1887), p. 259. *Type—maculivittella*, Rag., and *Pectinigeria*, Rag. Nouv. Gen., p. 43, for Sect. III, A.

4298. *Poujadia parviplumella*=4299. SALURIA ERODELLA, the branches of antennæ of the type of *parviplumella* appear to have been eaten off by some insect.

Sect. III. Maxillary palpi of male filiform; antennæ with uniserrate branches.

A. (*Pectinigeria*). Antennæ of male with sinus and tuft of scale at base.

4300. SALURIA OPIFICELLA.

4300*a*. SALURIA BREVICULELLA, Rag., Rom. Mem., viii, ined., pl. 37, f. 14.

♂. Head, thorax and abdomen yellowish-white; the antennal tuft black. Forewing ochreous-white, sparsely irrorated with fuscous scales, a short black antemedial streak on subcostal nervure and a speck on vein 1; a prominent speck at upper angle of cell; an oblique slightly sinuous postmedial series of specks on the veins ; a marginal series of black specks. Hindwing yellowish-white tinged with fuscous towards apex.

Habitat.—Mhow. *Exp.* 16 mm.

B. (*Saluria*). Antennæ of male without sinus and tuft.

4302. Saluria pulverosa, Hmpsn., Rom. Mem., viii, pl. 38, f. 3.

4302*a*. Saluria maculivittella, Rag., Ann. Soc. Ent. Fr. (1887), p. 258. Rom. Mem., viii, pl. 38, f. 7, and pl. 42, f. 26.

Saluria armeniella, Rag., Nouv. Gen., p. 44.

Head, thorax and abdomen ochreous. Forewing ochreous, with white streaks below median nervure and nervules, and on vein 1 ; the costal area, median interspaces and inner area irrorated with black, leaving ochreous fasciæ below costa and in submedian fold ; antemedial black points on median nervure and vein 1 ; an oblique postmedial series of points on median nervules and vein 1. Hindwing white.

Habitat.—Caucasus ; Central Asia ; Ceylon. *Exp.* 25, 26 mm.

P. 60. Under **Critonia**, insert *Singhalia*, Hmpsn., Rom. Mem., viii, ined.

Sect. I (*Singhalia*).—Palpi of male upturned, the 3rd joint porrect and very long ; maxillary palpi filiform ; antennæ laminate, without sinus and tuft.

4303. Critonia sarcoglauca, Rom. Mem., viii, pl. 51, f. 4.

Sect. II.—Palpi of male with the 2nd joint hollowed out to receive the brush-like maxillary palpi ; antennæ with the shaft thickened and ciliated, the tuft large and black.

4304. Critonia purpureotincta, Hmpsn., Rom. Mem., viii, pl. 51, f. 22.

4304*a*. Critonia promelæna, Hmpsn., Rom. Mem., viii, ined., pl. 51, f. 23.

♂. Differs from *C. purpureotincta* in the head and prothorax being suffused with black. Forewing very narrow, the costa less arched, the apex produced and acute ; a black and rufous streak below the purplish costal area from base to apex. Hindwing narrow.

Habitat.—Sikhim, 1800 ft. (Dudgeon). *Exp.* 26 mm. *Type*—In British Museum.

Sect. III. typical.

4305. CRITONIA ROSEISTRIGELLA, Rom. Mem., viii, pl. 51, f. 21.

4306. CRITONIA SUBCONCINELLA, Rag., Bull. Soc. Ent. Fr. (1890), p. ccxiv ; id., Rom. Mem., vii, pl. 6, f. 20.

P. 61. Under Polyocha insert *Monoctenocera*, Rag., Rom. Mem., viii, ined., for Sect. III.

Polyocha sanguinarella, Zell., is from S. Africa.

4307. POLYOCHA LEUCOCINCTA insert (Syn.) *Emmalocera crenatella*, Rag., Nouv. Gen., p. 38. This species is confined to Borneo, and has short uniserrate branches to the antennæ, whilst the Indian species LUCIDICOSTELLA, Rag., has the antennæ serrate.

4309. POLYOCHA AURIFUSELLA. Palpi of male upturned.

4312. Delete *Polyocha vareigatella*, Rag.

4312*a*. POLYOCHA STRIGIVENELLA, Hmpsn., Rom. Mem., viii, ined., pl. 51, f. 19.

♀. Head, thorax, and abdomen pale pink. Forewing rose-pink ; the veins white ; two white streaks in cell defined by pink lines ; white stripes in discal and submedian folds ; a deeper pink fascia below median nervure. Hindwing pure white.

Habitat.—Thayetmyo, Lower Burma. *Exp.* 22 mm.

4312*b*. POLYOCHA VESCULELLA, Rag., Nouv. Gen., p. 39 ; Rom. Mem., viii, pl. 36, f. 11.

♀. Head and thorax pink ; abdomen fuscous-brown. Forewing pale rose-pink ; a narrow white costal fascia with a broader brown fascia below it ; the subcostal and median veins white defined by fine brown lines ; the discoidal and submedian folds and vein 1 streaked with white. Hindwing fuscous-brown.

Habitat.—India. *Exp.* 38 mm.

4312*c*. POLYOCHA DIVERSELLA, Rag., Rom. Mem., viii, ined., pl. vi, f. 21.

♀. Head and thorax reddish-brown ; abdomen pale brownish. Forewing dull pink ; a pinkish-white costal fascia narrowing to base and apex defined on lower side by a broad area of fuscous-brown suffusion ; the veins strongly streaked with fuscous. Hindwing whitish.

Habiat.—Nilgiris. *Exp.* 31 mm.

4314*a*. POLYOCHA VARIEGATELLA, Rag., Nouv. Gen., p. 39 ; Rom. Mem., viii, pl. 36, f. 16.

♀. Head and thorax bright red; abdomen brownish, ochreous towards extremity. Forewing yellowish-white suffused with pink; a white costal fascia narrowing to base and apex, defined by a broad brown fascia becoming black towards base, the basal two-thirds of costa red; median nervure and nervules striped with bright red; a stripe in submedian fold; vein 1 white defined by bright red stripes. Hindwing yellowish-white, the apex tinged with fuscous.

Habitat.—Kangra; Sikhim. *Exp.* 24-32 mm.

4315. Insert *Monoctenocera brachiella*, Rag., Rom. Mem., viii, ined., pl. 36, f. 6, for the form with the branches of antennæ short, which is a distinct species.

Habitat.—Sikhim, Calcutta. *Exp.* 22-34 mm.

Delete *Polyocha vesculella*, Rag.

4323*a*. HOMÆOSOMA FUSCELLA, Rag., Rom. Mem., viii, ined., pl. 34, f. 3.

♂. Head and thorax fuscous-brown; abdomen paler. Forewing pale brown thickly irrorated with fuscous-brown; an obscure diffused fuscous fascia from base along median nervure, widening towards outer margin; no trace of transverse lines or discoidal and marginal points. Hindwing very pale brown.

Habitat.—Kolgaon, Kolaba District, Bombay. *Exp.* 22 mm.

4324*a*. HOMÆOSOMA ELONGATELLA, Rag., Rom. Mem., viii, ined., pl. 34, f. 4.

♂. Brown. Forewing pale brown slightly suffused with gray; a darker shade at base; the first line in the form of a broad dark band diffused outwardly and obtusely angled on median nervure; the second line gray obscurely defined on each side by fuscous and angled below costa; discoidal and marginal points obscure. Hindwing whitish slightly suffused with brown; the veins and a marginal line brown.

Habitat.—Bengal. *Exp.* 26 mm.

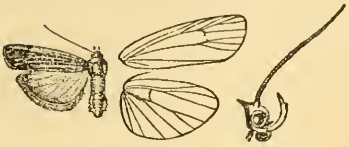
Genus ECCOPIDIA.

Eccopidia, Hampson, Rom. Mem., viii, ined.

Type.—*E. strigata*, Hmpsn.

Range.—Ceylon.

♀. Palpi upturned, slender, cylindrical, the 2nd joint reaching vertex of head, the 3rd as long as 2nd. Maxillary palpi filiform; frons rounded; antennæ of female almost simple. Forewing rather long and narrow; vein 2 from near angle of cell; 3 and 5 from angle, 4 absent; 8, 9 and stalked, 10 from cell. Hindwing with the cell about one-third length of wing, vein 2 from before angle; 3 and 5 on long stalk; 4 absent, 6, 7 stalked; 8 free.



Eccopidia strigata, ♀ ^{3}.

4325*a*. ECCOPIDIA STRIGATA, Hmpsn., Rom. Mem., viii, ined., pl. 48, f. 6.

♀. Head and thorax pinkish-rufous; abdomen brownish. Forewing pale pinkish, with about six fasciæ from base to outer margin which are dark pink irrorated with black, the costa pale. Hindwing pale brown.

Habitat.—Anapura, Ceylon (J. Pole). *Exp.* 18 mm. *Type.*—In British Museum.

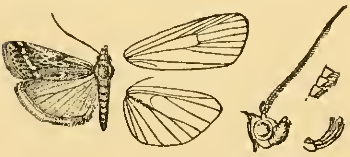
Genus PSOROSA.

Psorosa.—Zell., Isis, 1846, p. 749.

Type.—*P. dahliella*, Frr., from Europe.

Range.—Europe; Syria; Kashmir; Australia; Brazil.

Palpi upturned, thickly scaled and reaching above vertex of head, maxillary palpi typically filiform, in the *ornatella* group brush-like, and contained in a fold of the palpi; frons with slight tuft of scales; antennæ of male minutely serrate and ciliated, the shaft with a sinus and large tuft of scales at base. Forewing rather narrow, the apex rounded; vein 3 from near angle of cell; 4, 5 from angle and not in line with median nervure; 8 and 9 stalked, 10 from cell. Hindwing with vein 2 from close to angle of cell; 3 and 5 on a long stalk; 4 absent; 6, 7 shortly stalked; 8 free or anastomosing with 7.



Psorosa ornatella, ♂ $\frac{1}{1}$

4325*b*. PSOROSA ORNATELLA, Schiff., S. V., 319; Dup., Lep. Fr., x. 1. pp. 189 and 279.

Head and thorax pale rufous; abdomen pale fuscous with the anal tuft ochreous. Forewing pale brown with a reddish tinge;

the costal half of wing rather dark; the veins clothed with dark scales; the 1st line represented by an oblique white line from costa to median nervure diffused inwards, and with a dark speck on its outer edge at median nervure, and by a white and dark speck on vein 1; two prominent black discoidal points on a diffused whitish triangular patch on costa, the 2nd line oblique, white, and straight, except for a slight curve outwards at median nervules; some whitish suffusion on margin, broad below apex, and with a prominent series of black marginal points on it. Hindwing suffused with pale fuscous; a fine marginal line; cilia white with a fine line through them.

Habitat.—Europe; Armenia; Gourais Valley, Kashmir. *Exp.* 22 mm.

Vol. iv, p. 68. The Type of *Heterographis* is *convexella*, Led., from Europe.

4325*c*. HETEROGRAPHIS UMBRILIMBELLA, Rag., Rom. Mem., viii, ined., pl. vi, f. 19.

♂. Head reddish; thorax and abdomen ochreous-white. Forewing ochreous-white with pure white costal fascia; a pink marginal band not reaching costa or outer angle; cilia pale fulvous. Hindwing pure white.

Habitat.—Multan, Ajmere. *Exp.* 14 mm.

4325*d*. HETEROGRAPHIS OCTELLA, Hmpsn., Rom. Mem., viii, ined., pl. 48, f. 20.

Head blackish; thorax and abdomen ochreous. Forewing ochreous, some pink streaks on basal area; an oblique antemedial white line, with some black scales on it near median nervure, and pink marks on its inner and outer edges; two black discoidal points on a figure of eight-shaped white patch; an oblique white postmedial line defined by fuscous on its inner edge, and with the area beyond it fuscous. Hindwing pale brownish. Antennæ of male with a sinus at base of shaft containing scale-teeth.

Habitat.—Puttalam and Hambantota, Ceylon (J. Pole). *Exp.* 10 mm. *Type*—In British Museum.

4334. HETEROGRAPHIS BENGALELLA. Forewing with veins 4, 5 approximated for half their length; 10 from cell.

4335*a*. HETEROGRAPHIS VERSICOLORELLA, Rag., Ann. Ent. Soc. Fr., (1887), p. 249.

♂. Antennæ with the shaft curved at base and with slight black scale teeth in the sinus. Differs from *H. suboblitella* in being paler; the forewing more fulvous and much less suffused with black; a distinct almost pure white costal fascia from base to second line; the first line whiter; the second more oblique towards costa, less excurved at middle, and whiter. Hindwing paler; the cilia pure white.

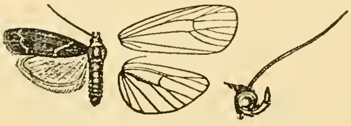
Habitat.—Krasnovodsk, Siberia; Ajmere, Punjab. *Exp.* 18 mm.

Genus NYCTEGRITIS.

Nyctegritis.—Zell., Isis, 1848, p. 650.

Type.—*N. achatinella*, H.S., from Europe.

Range.—Palæarctic region; Japan; Bengal; W. Africa.



Nyctegritis resticula, ♂ $\frac{2}{1}$.

Proboscis well developed; palpi upturned widely in front of frons, thickly scaled, the third joint as long as the second, and reaching above vertex of head; maxillary palpi filiform: frons rounded and somewhat prominent; vertex of head with rough hair; antennæ simple. Forewing rather narrow, the costa evenly curved, the apex rounded; vein 2 from well before angle of cell; 3 from angle; 4, 5 stalked; 8, 9 stalked. Hindwing with the cell about half the length of wing; 2 from well before angle; 3 and 5 stalked; 4 absent; 6, 7 from upper angle; 7 anastomosing with 8 to two-thirds of wing.

In the typical section vein 10 of forewing arises from the cell.

Sect. II. Forewing with vein 10 absent.

4333. NYCTEGRITIS RESTICULA.

Under **Ancylosis** insert *Ancylodes*, Rag., Ann. Soc. Ent. Fr., (1887), p. 250.

4336*a*. ANCYLOSIS PALLENS, Rag., Ann. Soc. Ent. Fr. (1887), p. 250.

Ochreous-white. Forewing slightly irrorated with black scales, especially on the veins. Hindwing with pale brown marginal line.

Habitat.—Spain; Syria; Karachi. *Exp.* 20 mm.

4341. ANCYLOSIS NIVEICOSTELLA.

Antennæ of male with a sinus at base of shaft containing scale-teeth.

(*To be continued.*)

THE FERNS OF NORTH-WESTERN INDIA,

Including Afghanistan, the Trans-Indus Protected States, and Kashmir: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with new Species added.

By C. W. Hope.

(Read before the Bombay Natural History Society, on 28th of Feb., 1899.)

PART I.—INTRODUCTORY.

The object of this paper is to bring into one view the information regarding the ferns of the North-West Indian region which is to be found in the standard English works on ferns, and to add to that the results of my own observation and study, acquired during a long residence in India and since I left that country.

I have limited my review to the regions named in the title, because my observations and study have been chiefly so limited. Collections were made by me in parts of Kumaon in 1861, and again in 1890; in the Dehra Dun district—at various levels—at intervals from 1879 to 1895; in Simla in 1871, and again there and along the Thibet Road eastward for some 50 miles in 1886. The late Mr. H. C. Levinge began the study of ferns after seeing what I collected at Simla in 1871; and he collected diligently at Darjeeling and in other parts of Sikkim, in Bengal, and also in Kashmir and parts of the North-West Himalaya, until he left India in 1883, and he never failed to give me a share of what he got, even when I had nothing to give him in exchange. Mr. C. B. Clarke also has several times given me generous contributions of ferns collected in Sikkim, Assam, and other parts of India. And Mr. Gustav Mann, whose fame as a botanist and collector has been so often signalised by plants being named after him, has given me in exchange for North-West Indian ferns about 150 species collected by himself in Assam, where he was Conservator of Forests for many years. Since the year 1881 I have from time to time seen and examined all the ferns collected in the North-Western Himalaya, Kashmir, and the Trans-Indus Protected States by Mr. J. F. Duthie, the Director of the Botanical Department, Northern India, and his collectors, and have generally shared in the distribution made by him; and I have several times studied the ferns in the herbarium at Saharanpur, which, under Mr. Duthie's charge, have increased from one small bundle to a very considerable collection. Since the year 1880 the ferns collected in and around Mussoorie, the hill station in the Dehra Dun district, by Mr. P. W. Mackinnon and Mr. V. A. Mackinnon of that place, have from time to time been studied by me ; and during the same period extensive collections made in the Chamba and Kashmir States by Mr. J. C. McDonell, of the Imperial Forest Department, now on deputation as Conservator of Forests in Kashmir, have been at my disposal for study. I have to thank the Messrs. Mackinnon and Mr. McDonell for many fine specimens. I frequently exchanged views and specimens with the late Mr. H. F. Blanford, F.R.S., who collected for some years in the Simla region, and embodied the results of his study in a paper published in the "Journal of the Asiatic Society of Bengal" in 1888. Probably every specimen of many hundreds collected in the Punjab and Kashmir, and also in Kumaon, by Mr. E. W. Trotter, of Rawalpindi and Murree, in the years 1887 to 1892, has been scrutinised by me, and my collection has been greatly increased by his gifts. Major R. W. MacLeod, I.S.C., showed me collections made by him in Western Kashmir in 1891, and in Kumaon in 1893, and gave me many fine specimens. I have seen the collections made in the Simla region by Mr. T. Bliss, of Lahore and Simla, an enthusiastic collector and horticulturist, and I possess many fine specimens given to me by him. And, lastly, for several years before I left India, the extensive collections made by Mr. J. S. Gamble (Director of the Imperial Forest School at Dehra Dun) in the Simla region of the Punjab, the Dehra Dun district of the North-Western Provinces (which includes the Himalayan tract—Jaunsar-Bawar), the Tehri-Garhwal Hill State, Sikkim and Bhutan, in the North-Eastern Himalaya, the Chittagong and Chutia-Nagpur divisions of Bengal, and the Madras Presidency, were available ; and Mr. Gamble has given me many specimens collected by him in the Dehra Dun district and Tehri-Garhwal in places which I have never been able to visit. Early in 1896, I spent some busy days in the herbarium of the Calcutta Botanic Garden, taking notes of the North-West Indian ferns there, and verifying conclusions as to the species included in this paper. I desire to record my grateful thanks to Sir George King, the late Director of the Botanical Survey of India, and to Dr. D. Prain, who has lately succeeded him, for the help they then gave me. Finally, it may be mentioned that in 1872, and again in 1888-89, I studied the

North Indian ferns in the herbarium of the Royal Gardens, Kew, where views were interchanged not only with Mr. J. G. Baker, F.R.S., but with Mr. C. B. Clarke, F.R.S., past President of the Linnean Society, and Colonel R. H. Beddome, F.L.S., the author of various works on Indian ferns. And, while preparing this paper, I unexpectedly found myself able to leave India and to settle at Kew; and on resuming the study of ferns there—a work which was at first much hindered by ill-health—I soon found it advisable to refrain from publication until I could again carefully go through the whole material, and also that in the herbarium of the British Museum and the Wallichian Collection belonging to the Linnean Society, at both of which institutions I was made welcome. During this final period of study I have had the advantage of free access to Colonel Beddome's valuable collection, and of discussion with him as to critical plants common to both Northern and Southern India.

Following the example set by Mr. C. B. Clarke in his "Review of the Ferns of Northern India,"* I have not attempted to make this paper a complete account of the species enumerated in it. I may say, as Mr. Clarke said of his, that my paper is meant to be an appendix to Hooker and Baker's *Synopsis Filicum*; but it is also an appendix to Mr. Clarke's "Review," so far as the species found west of Nepal are concerned, and the remarks on the species are in part additions to, and corrective of, those works. They are also, and necessarily so, largely corrective of Colonel Beddome's "Handbook of the Ferns of British India, &c.," including the Supplement of 1892, so far as it deals with the ferns found within my limits, for his descriptions of them, and remarks, were chiefly taken from the *Synopsis Filicum* and Mr. Clarke's "Review." I have, as a rule, given no diagnoses of the species which have already been described in those works, but have merely corrected or supplemented them where it seemed necessary to do so. I have written full descriptions of the new species I propose, and also in some cases of the plants I have raised from the rank of variety to that of species.

References are given to three books only, namely, Hooker and Baker's *Synopsis Filicum*, Clarke's "Review of the Ferns of Northern India, &c.," and Beddome's "Handbook of the Ferns of British India,

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* Transactions of the Linnean Society, 2nd Series, Botany, Vol. I (1880).

&c.," with its Supplement of 1892 ; and I have quoted the name given to each of my species in each of those works ; though in some cases I have found it difficult to identify them. As a rule, no further attempt has been made to give the synonymy of the species : that will be found sufficiently given in the books I refer to ; and as this paper is merely a supplement to these, and not a complete treatise, I see no necessity for repeating what is already in print. Mr. Clarke said in his "Review:" "No person is likely to undertake the study of Indian ferns without this book" [the *Synopsis Filicum*] "at his elbow ; and I have not wished to print more repetition than the large quantity always absolutely necessary in work of this kind." So I would say of Mr. Clarke's "Review"—though the price of the "Transactions of the Linnean Society," in which it appeared, is somewhat prohibitory. Beddome's "Handbook" also must be kept at hand and the Supplement of 1892. A third edition of the *Synopsis Filicum* is much wanted, though Mr. Baker, in 1891 and since, has contributed summaries of new ferns discovered or described since 1874 to the "Annals of Botany."

The system of classification and nomenclature followed in this paper is that of Hooker and Baker's *Synopsis Filicum*. Specific names used in the *Synopsis*, in Clarke's "Review," and in Beddome's "Handbook," with its Supplement, are adhered to so far as is possible. And in reviving some species which, though originally proposed and named by competent authorities, have been dropped by recent authors, and in raising so-called varieties to the rank of species, I have adopted the names originally given by the collectors or describers of them.

The present list admits 212 species : of these 16 are new, including 3 which have before been described by other authors as varieties of old species ; 45 are new to the regions dealt with, and 6 old species are new to the Indian region. 20 are old species revived, or so-called varieties erected into species. In his "Review" Mr. Clarke admitted 363 species of ferns, besides many varieties, in Northern India, of which 16 were new. 142 species were, he said, found in the Himalaya west of Nepal, including Afghanistan apparently.

No place is given in this list to so-called varieties, though in a few instances "forms" are noted where there seems to be a divergence from the normal, due probably to difference of altitude or climate, but insufficient to prevent identification or to warrant separation as a species. To such "forms" separate numbers are not given. So-called varieties, when distinct enough from the so-called types to be separately described, and, so far as I know, constant as to characters, are given as species in the absence of any good reason why they should be given any less important a position. Most of these were originally named or described by authors as growing in India, the types of which are expressly stated as not having been found in that region. Thus, after giving an elaborate description of *Asplenium* (*Athyrium*) *Filix-fœmina*, Bernh. (*forma europœa*), apparently by himself, Mr. Clarke goes on to say that the typical form has not exactly been got in the Himalaya, and to give no less than seven varieties of it, which have been got there, with a short description of each. In this case Colonel Beddome, in his "Handbook," follows Mr. Clarke almost *verbatim*, giving all seven varieties. At least two of these, *A. Schimperi*, A. Br., and *A. pectinatum*, Wall., which have widely creeping and branching rhizomes or *sarmenta* and distantly springing fronds instead of the erect caudex and fasciculate vernation of *A. Filix-fœmina*, have been recognised as good species by Colonel Beddome in the Supplement to his "Handbook." In the other instance, that of *Naphrodium* (*Lastrea*) *Filix-mas*, Rich.,

CORRECTIONS.

Vol. XII., page 319, bottom line, for "Naphrodium" read "Nephrodium."
" " 323, 20th line from top, for "West" " "East."
" " 411, 17th " " bottom, for "holes" " "boles."
" " " 20th " " " " "general" " "genial."
" " 412, 8th " " top, for "*Bifosoma*" " "*Ligosoma.*"
" " " 9th " " " " "digested" " "ingested."

&c.," with its Supplement of 1892 ; and I have quoted the name given to each of my species in each of those works ; though in some cases I have found it difficult to identify them. As a rule, no further attempt has been made to give the synonymy of the species : that will be found sufficiently given in the books I refer to ; and as this paper is merely a supplement to these, and not a complete treatise, I see no

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In two notable instances numerous varieties of plants have been set up by authors as growing in India, the types of which are expressly stated as not having been found in that region. Thus, after giving an elaborate description of *Asplenium* (*Athyrium*) *Filix-fœmina*, Bernh. (*forma europœa*), apparently by himself, Mr. Clarke goes on to say that the typical form has not exactly been got in the Himalaya, and to give no less than seven varieties of it, which have been got there, with a short description of each. In this case Colonel Beddome, in his "Handbook," follows Mr. Clarke almost *verbatim*, giving all seven varieties. At least two of these, *A. Schimperi*, A. Br., and *A. pectinatum*, Wall., which have widely creeping and branching rhizomes or *sarmenta* and distantly springing fronds instead of the erect caudex and fasciculate vernation of *A. Filix-fœmina*, have been recognised as good species by Colonel Beddome in the Supplement to his "Handbook." In the other instance, that of *Naphrodium* (*Lastrea*) *Filix-mas*, Rich., Mr. Clarke wrote a diagnosis, which, he said, was "designed to include various North Indian ferns difficult to separate from the ordinary European *N. Filix-mas*, *i.e.*, the first four varieties following"; and he then gave nearly as long diagnoses of each of these four, with figures of three of them, and diagnoses of three more varieties, with figures of them. Colonel Beddome gave in his "Handbook" a description of *N. Filix-mas* entirely different from that written by Mr. Clarke, and said the plant was found "throughout the Indian region, but generally confined to considerable elevations on the mountains"; and he then gave four varieties, in the first of which—*var. β. parallelogramma*, he combined two of Mr. Clarke's varieties and three other plants which had previously been described as species. Another of these varieties Colonel Beddome gave—*N. cochleatum*, Don.,—Mr. Clarke had given as a distinct species, hesitating to give it generic rank, though it had previously been made a new genus by two different authors. In his Supplement of 1892, Beddome says the European type of *Lastrea Filix-mas* does not occur in India! But he repeats the four varieties given in the "Handbook," including *L. cochleata* (sp.), Don, and adds six new ones, two of which—*Nephrodium subtriangulare* and *N. assamense*—are sub-tropical, low-level species, which had been described by me in the "Journal of Botany" for November, 1890, and included by Mr. Baker as described new species in his "Summary of New Ferns" published in 1891. Here, then, are in India ten varieties of a fern which itself is said not to occur in India, only two or three of which Colonel Beddome can, I think, have seen growing.

In other cases authors have not hesitated to place common North-West Indian ferns as mere varieties of species not found at all in North-West India, *e.g.*, *Pteris stenophylla*, Hk. & Gr., Ic. Fil., t. 30, was placed by Hooker, in his *Species Filicum*, as a mere variety of *Pteris cretica*, L., and this reduction has been perpetuated by Mr. Baker. But Mr. Clarke in his "Review" altered this reduction, and placed *P. stenophylla* as a variety of *P. pellucida*, Presl.; and Colonel Beddome followed suit. *P. pellucida* has never been got in North-West India. *P. stenophylla* is wholly unlike it, and it is very plentiful in some localities round Mussoorie—exactly Hooker and Greville's plant. After long and intimate acquaintance with this fern, I have no hesitation in calling it a species.

The theory underlying all this restriction or reduction of species seems to be that recently observed plants, however apparently distinct, are likely to be mere varieties of previously known and described species. But a variety must surely be a variation proved to have originated from a known plant, and not merely a different plant which botanists think resembles a well-known plant, and, from dislike to increase the number of species, choose to call a mere variety of it.

I am well aware that there are hundreds of cultural varieties of ferns—European chiefly—and that these, having been propagated from plants found wild, retain their characters permanently when cultivated, or diverge even further from the type. But such varieties are for the most part sports, or monsters in appearance, and no one thinks of setting them up as species; and botanists do not even enumerate them under the species from which they are known or are supposed to have originated. Fern-fanciers, on the other hand, would probably cease to take an interest in them if they were recognised by botanists as species. Such sports are rarely found in India, and when met with are treated as sports not named as varieties. The so-called varieties of Indian ferns are serious entities, with no eccentricities of form or habit, and, were it not for slight or fancied resemblances in them to previously described species, there seem to be no good reasons why they also should not be favoured with full descriptions and specific names. Differences of mode of growth and venation are surely good specific distinctions; and yet we find plants so differing grouped under the same specific name, and one called a variety of the other on merely fanciful grounds. There is sometimes doubt as to the separate entity of species described in the books, because the nature of the rhizome has not been observed and described. For this collectors are of course partly to blame; but in many cases authors are silent as to the rhizome, and seem to think it a feature of no importance. An isolated plant with a woody root-stock, perhaps nearly as thick as one's wrist, of slow and almost secular growth, and which is erect, or merely decumbent, and throws up fronds from the apex in a tuft, and, if decumbent, dies off behind, while it continues to grow slowly forwards, is of a totally different nature from a fern which has a thin, perhaps succulent, quickly growing and widely-creeping and branching rhizome or *sarmentum*, which throws up fronds singly at greater or less intervals over a large surface of ground ; and it seems impossible that the same species of fern can ever have habits so widely differing as those I have just described. I think I may challenge fern-fanciers to produce an instance of variation between such habits. It is, though there are others, mainly on this ground that Mr. E. W. Trotter and I have separated *Polypodium* (*Pheg.*), *late repens*, Trotter MS., from *P. distans*, Don, which has an erect caudex, and that I am now proposing *Nephrodium* (*Lastrea*) *repens* as a new species, distinct from *Aspidium ochthodes*, Kze. (*Nephrodium prolixum*, Baker).

Some pains have been taken to give the habitats of the species in regular order from West to East,* and in sufficient detail to show the distribution in India ; and the distribution in other parts of the world has been carefully arranged by continents, which is not always satisfactorily done in the three works here followed and reviewed. And, except in the cases of the long recognised and common species, the authorities for the habitats or the names of collectors whose specimens have been seen and are known to have been gathered in the habitats named, have been quoted. I have not used the mark " ! " ; but it must be understood that I have either seen the specimens on which I found, or have satisfied myself, that my authority for their existence is trustworthy. This mark (!) is not used in the books I make reference to. As to the new or rarer species, the year of collection, in other cases the names of collectors—at least those of the more modern of them—are arranged, under the geographical areas, in the order of date of collection. This much seems due to those who have done so much of late years, and have helped to make the present list so full ; and in many cases it is an acknowledgment of specimens given to myself. And such full citation seems to give authority which might otherwise be thought wanting. Such an entry as—" Himalayas, ascending to 10,000 feet "—does not seem at all sufficient, or even useful. Taken literally, this would mean —" throughout the Himalaya, from west to east, and at all altitudes from the plains up to 10,000 feet " ; but in many such instances it turns out that the plant has been got only in the Eastern Himalaya, and not below (say) 5,000 feet. Again: " Himalayas, from Garhwal to Bhotan," not only involves the assumption that the plant grows from west to east of Nepal, a country of many hundreds of miles in length that has not been open to explorers for the last 70 years or so, but it leaves in doubt in what part of Garhwal—a tract extending from the Tons to the Ramganga—the plant has been gathered. Especially in the cases of new species, or species new to India, or to the limits dealt with in this paper, does it seem proper to give full authority for statements as to habitat. Colonel Beddome, in the Supplement to his "Handbook," enters *Cystopteris montana*, Link., as a species new to India; but he gives "Cashmir" as the habitat, and does not give the name of the person who found it there. Until recently, when I found in the Kew Herbarium a specimen of this fern collected in Kashmir in 1877 by the late Dr. Aitchison, I was unaware of the authority for this habitat, and before I read of it I had believed that the plant had not been found in Asia, except in Kamschatka, until 1884, when it was found in Kumaun, in the North-West Himalaya, at an altitude of 12,000 to 13,000 feet, by Mr. Duthie. Other stations for the plant were discovered by Mr. Duthie over the west border of Nepal in 1886; but he never found it in Kashmir. So far as I know, no one besides Dr. Aitchison and Mr. Duthie has ever found this plant between the Carpathians in Europe and the extreme west of Asia. In the case of another entry in Beddome's Supplement—*Asplenium germanicum*, Weiss—said to have been got in Kashmir, and therefore to be new to the Indian region—the collector's name ought to have been stated. Mr. J. C. McDonell did find a scrap of this species in Kashmir early in 1891; but he did not know he had got it until sometime after Colonel Beddome's Supplement had been published. As will be seen, recorded in the proper place, *A. germanicum* had been got previously in Afghanistan and Chamba.

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* The Hazára District of the Punjab lies to the westward of Kashmir, but is given along with the other districts of the Punjab for convenience sake.

For reasons which will be obvious, when it is considered that this paper is being published in instalments, all the new species are given first, as PART II.; and Plates of all of them will be issued along with the descriptions, or thereafter, as may be found possible. Not being a draughtsman, I am at a disadvantage in attempting to give illustrations; but Mr. N. E. Brown, the well-known botanist, has carried out my ideas and wishes very correctly as well as artistically. The details and enlargements and arrangement of the Plates are entirely Mr. Brown's; but as he could not spare time for making the finished drawings of fronds, these have been done, from his sketches and the specimens we selected from my herbarium, in Calcutta, by Bengal artists, under the supervision of Dr. D. Prain, the Superintendent of the Royal Botanic Garden, Calcutta, who also kindly adopted the undertaking by his predecessor, Sir George King, to have the Plates lithographed for me (and the Bombay Natural History Society) in Calcutta, where, as is well known from the numerous examples in the "Annals of the Royal Botanic Garden, Calcutta," such work is very efficiently done. My very best thanks are due to Dr. Prain for having thus so materially contributed to the preparation of this paper. I am also greatly indebted to him, as well as to Sir George King and Mr. J. F. Duthie, for their help in securing the co-operation of the Bombay Natural History Society for the publication of my paper in their valuable Journal. To Mr. Duthie I must also express my grateful thanks for having passed the final proofs for the press at Bombay, which has saved many weeks of time. Additional Plates will, I hope, be given from time to time, as I may be able to get them prepared; the Society in Bombay is not wanting in liberality in that respect.

LIST OF ABBREVIATIONS.

BOTANICAL TERMS.

Caud. : caudex, from which arises the frond or stipes.

Rhiz. : rhizome, a creeping or climbing stem, taking the place of a caudex.

St. : stipes, or stipites, the stalk of the frond.

Fr. : Frond, or fronds, exclusive of the stipes.

Rh. : rhachis, the continuation of the stipes up the middle of the frond to the terminal point.

Sec. Rh. : secondary rhachis, or rhachises, the main branch or branches of the rhachis.

Pinn. : pinnæ, the primary complete divisions of a frond.

Pinnl. : pinnule or pinnules, the secondary complete divisions of a frond, or complete divisions of a pinna.

Segm. : segments, the divisions of a pinna, or of a pinnule, when more than mere teeth, lobes, or crenations.

Ven. : venation, the system of veins in a frond, pinna, pinnule, or segment.

Costa : the main vein of a group proceeding from a rhachis.

Invol. : involucre, the covering (cup or cap) which incloses and protects the sorus.

MEASURES OF LENGTH.

Ft. : foot or feet.

In. : inch or inches.

L. : long, thus 1 in. l., 1 ft. l.

W. : wide } thus 1 in. w., or 1 in. br.
Br. : broad }

5-7000′ : 5000 to 7000 feet altitude. 55-7000′ : 5500′ to 7000′.

Authors' Names and their Works.

Hook. Sp. Fil. : Sir W. J. Hooker's *Species Filicum.*
Syn. Fil. : Hooker and Baker's *Synopsis Filicum.*
C. R. : Mr. C. B. Clarke's "Review of the Ferns of Northern India."
Bedd. H. B. : Colonel R. H. Beddome's "Handbook of the Ferns of British India" and Supplement.
Wall. : Wallich in *Catalogue of Plants.*

(Besides other abbreviations already in general use.)

Names of Habitats.

Afghan. : Afghanistan.
Trans-Ind. States : Trans-Indus Protected States.
Simla Reg. : Simla Region.
N.-W. P. : The North-Western Provinces of the Bengal Presidency.
(*Him.*): The Himalaya Range of Mountains.
D. D. Dist. : The Dehra Dun District of the N.-W. Provinces.
T. Garh. : The Tehri Garhwal State in the N.-W. Himalaya.
Brit. Garh. : District of British Garhwal.
N. Ind. : Northern India.
Centr. Ind. : Central India.
Centr. Prov. : The Central Provinces of India.
S. Ind. : Southern India.
Malay. Penins. : The Malayan Peninsula.
Masc. Isles. : Madagascar, Mauritius, Bourbon, etc.
Vy. : Valley.

(Besides other usual and obvious abbreviations.)

Collectors' Names.

Aitch. : the late Dr. J. E. T. Aitchison.
Beddome : Colonel R. H. Beddome.
Blanf. : the late Mr. H. F. Blanford.
Bliss : Mr. T. Bliss.
C. B. Clarke : Mr. C. B. Clarke.
Davidson : Colonel Davidson.
Duthie : Mr. J. F. Duthie and his collectors.
Edgew. : the late Mr. M. P. Edgeworth.
Gamble : Mr. J. Sykes Gamble.
Gammie : Mr. G. A. Gammie.
Hook. fil. : Sir J. D. Hooker.
Hope : Mr. C. W. Hope.
Jacquem. : Jacquemont.
King : Sir George King.
Lace : Mr. J. H. Lace.
Lev. : the late Mr. H. C. Levinge and his collectors.
Mackinnons : Mr. P. W. Mackinnon and Mr. V. A. Mackinnon, and their collectors.
MacLeod : Colonel R. W. MacLeod.
M'Donell : Mr. J. C. M'Donell.
Mann : Mr. Gustav Mann.
R. Blink. : Mr. R. Blinkworth.
S. & W. : Strachey and Winterbottom.
Trotter : Mr. E. W. Trotter.
T. T. : Dr. T. Thomson.
Watt : Dr. George Watt.

(*To be continued.*)

NOTE ON THE LAND MOLLUSCA OF BOMBAY.

By W. T. Blanford, F.R.S.

(*Read before the Bombay Natural History Society on 28th of Feb.*, 1899.)

In the Journal of the Bombay Natural History Society, Vol. XI, p. 131, is a very good account of the terrestrial Mollusca found in Bombay Island by Mr. A. J. Peile, R.A. The list given contains all the kinds known to occur in the island, and comprises the following 15 species :—

Cyclophorus indicus.
Ariophanta lævipes.
A. bajadera.
Nanina pedina.
N. (Microcystina) tenuicula.
N. (M.) perrotteti.
Helix (Trichochloritis) propinqua.
Pupa (Leucochila) cænopicta.
Buliminus (Mastus) insularis.
B. abyssinicus var. moussonianus.
B. (Rhachis) bengalensis.
B. (R) punctatus.
Stenogyra gracilis.
Glessula sp.
Succinea vitrea.

With one exception I believe the species are correctly identified, though I cannot always concur in the generic names. But genera among Pulmoniferous Mollusca are, and are likely to remain for a long time to come, either guesses (when the animal has not been critically examined) or else mere expressions of individual views. Species are far more definite, at all events when those of one locality come under consideration. The particular species as to the name of which I would suggest further consideration is that which Mr. Peile (p. 134) identifies as *Nanina* (*Microcystina*) *perrotteti*. I am well acquainted with the Bombay Mollusk, which is pretty common (or was some thirty years ago) on Malabar Hill, and which attracted my attention by having, instead of the pointed, narrow shell-lobes (or as Mr. Peile very aptly calls them shell-polishing lobes) of *Macrochlamys*, (the genus to which I refer both *M. pedina* and *M. tenuicula*, although neither is a typical form) broad spatulate lobes which, in the height of the monsoon, when the mantle and its lobes are fully developed, completely cover the shell.

The name *Helix perrotteti* was applied by Pfeiffer to a species inhabiting the Nilgiri Hills. It was described as " *spira brevissime subturb-*

inata, apice acutiuscula, anfr. 5½, *Diam. maj.* 8, *min.* 7, *alt.* 4 *mill.*" The Bombay shell has neither a subturbinate spire nor a sharpish apex; it has but 5 whorls, and the measurement of an average specimen is about 11 millemetres in major diameter, 9½ in minor, and 5½ in altitude. I have collected in some numbers on the Nilgiris, at Pykara and Avalanche, a shell that precisely corresponds to Pfeiffer's description of *H. perrotteti* both in form and measurements, but which is not the same as the Bombay species. For the latter, in 1880 (Joun. As. Soc. Beng., Vol. XLIX, Pt. 2, p. 195, pl. ii, fig. 9) I proposed the name of *Macrochlamys* (?) *platychlamys*,* and I mentioned that I had obtained this species, or a shell which I was unable to distinguish from it, from Champanir near Broach to the North, and from the Wynaad to the South.

Specimens of this Mollusk and of other Bombay species have recently, by the kindness of Mr. Phipson (and I believe of Mr. Peile) been sent to me, and the animal has been dissected by Col. Godwin-Austen, to whom we are indebted for many additions to our knowledge of Indian snails. The result, I hope, will shortly be published. The animal proves to be somewhat different in several respects from typical forms of *Macrochlamys*, such as the Bengal shell commonly, but incorrectly, known as *M. vitrinoides* (*M. indica* of Benson, *M. pseudovitrinoides* of Nevill), and must be placed in a separate sub-genus. *M. pedina* also exhibits striking peculiarities of its own.

I do not think that either *Macrochlamys tenuicula* or *M. Platychlamys* can be referred to *Microcystina*, a sub-generic group founded on *M. rinkii*, an Andaman snail with a peculiar notch in the columella. It is true that Mr. G. Nevill, in his Hand-list of Mollusca in the Indian Museum, Calcutta, referred numerous small forms of *Macrochlamys*, and amongst them *M. perrotteti* and *M. tenuicula* to *Microcystis* of Beck, but in this he was certainly in error, and moreover *Microcystis* and *Microcystina* are by no means the same. I think it possible that Mr. Peile has taken his nomenclature in part from Nevill's Hand-list, because he adopts the specific name *tenuicola*, which was a mistake or misprint of Nevill's, instead of *tenuicula*, the term originally applied by A. Adams.

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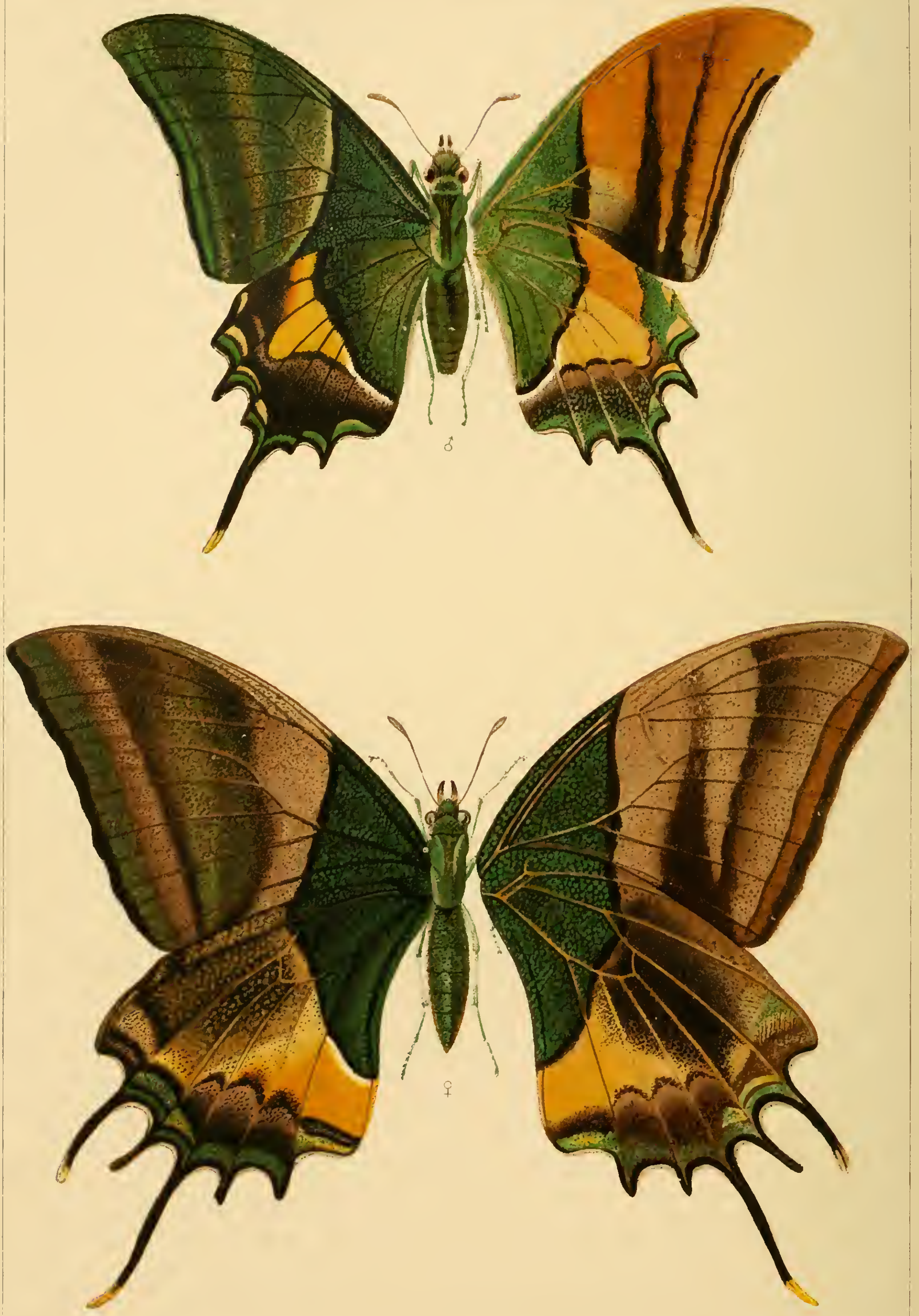
* πλατυς, broad ; Χλαμυς, a cloak or mantle.

The only species of *Glessula* that I have certainly from Bombay Island is *G. notigena* (Bs.), some specimens of which were obtained by myself. I have another species marked "Island of Bombay," but I did not procure it myself, and it is possible there may be a mistake about the origin of the only specimen I possess.

Rhachis punctata is found throughout a large area in the Bombay Presidency, but the occurrence in Bombay Island of *R. bengalensis*, the representative Bengal form, is, I strongly suspect, due to that species having been introduced. The ova or young might easily have been brought with plants. It is not improbable that *Buliminus insularis* which, as Mr. Peile points out, is an inhabitant of a drier climate than that of Bombay Island, may also have been unintentionally imported by man.

L. de NICÉVILLE, Journ. Bomb. Nat. Hist Soc. Plate BB.



West, Newman chromo.

TEINOPALPUS IMPERATRIX.

NOTES ON SOME BUTTERFLIES FROM TENASSERIM IN BURMA.

By Lionel de Nicéville, F.E.S., C.M.Z.S., &c.

With Plate BB.

(*Read before the Bombay Natural History Society on 28th of Feb.*, 1899.)

In October and November, 1898, I visited Mandalay and other places in Upper Burma, and at Taungoo, on the northern borders of Tenasserim, examined the collection of butterflies made by Mr. T. A. Hauxwell, Deputy Conservator of Forests, during the last few years in Tenasserim, with that gentleman. As the collection contains many rare and interesting species, I made notes regarding all such, which notes are embodied below, together with some field notes by Mr. Hauxwell, the latter being given in quotation marks.

Family NYMPHALIDÆ.

Subfamily Satyrinæ.

1. Anadebis himachala, Moore.

Occurs rarely in the Chin Hills, Upper Burma, in April. The usual pale outer marginal area in these specimens is "almost obsolete" Mr. Hauxwell notes.

2. Neorina crishna, Westwood.

This species was described from Java and Northern India. Mr. Moore in "Lep. Ind.," vol. i, p. 227 (1892), says that the type specimen is from Java and is now in the British Museum. *N. crishna* is quite distinct from *N. westwoodii*, Moore, from Assam. *N. crishna* occurs in the Yé Valley, Lower Tenasserim, in February and March, and in the Ataran Valley, Middle Tenasserim. "Found in high bamboo jungle only. Rests chiefly on the ground, occasionally settles low down on bamboo sprays. Is very rare." Tenasserim specimens agree absolutely with Javan ones in my collection.

3. Cœlites binghami, Moore.

"Crepuscular, flies only in the evening along open paths through evergreen jungle."

4. Zophoessa sura, Doubleday and Hewitson.

One male from the Daunat Range, Middle Tenasserim, taken in March.

5. Blanaida bhadra, Moore.

Taungoo Hills, Upper Tenasserim, 4,000 feet, February.

6. BLANAIDA PULAHA, Moore.

Taungoo Hills, 4,000 feet, November.

7. ORINOMA DAMARIS, G. R. Gray.

Taungoo Hills, 4,000 feet, May.

Subfamily ELYMNIINÆ.

8. ELYMNIAS (*Bruasa*) CHELENSIS, de Nicéville.

Taungoo, December ; Daunat Range, February ; males only.

Subfamily AMATHUSIINÆ.

9. ZEUXIDIA DOUBLEDAII, Westwood.

One male, Ataran Valley, March. I possess another male from Tavoy in Lower Burma, taken in April. Mr. Moore does not include this species from India in his " Lep. Ind."

10. STICHOPHTHALMA CAMADEVOIDES, n. sp.

Occurs rarely in the Chin Hills, Upper Burma, in April. The ocelli on the underside in these specimens are all complete and are much more distinct than in examples from Sikkim and Assam, and the outer-discal blue band on the upperside of the hindwing has each component spot of equal breadth throughout, instead of being cone-shaped ; consequently the band is continuous instead of being formed of pairs of spots, each pair being anteriorly well separated from the pair on either side of it. I have a specimen (the type) from the Katha District of Upper Burma.

11. ÆMONA LENA, Atkinson.

One pair of this exceedingly rare species taken in the Taungoo Hills, 4,000 feet, in May.

Subfamily NYMPHALINÆ.

12. CHARAXES (*Haridra*) NICHOLII, Grose Smith.

One male taken in the Daunat Range in March.

13. CHARAXES (*Eulepis*) SCHREIBERI, Godart.

One female taken in the compound of Mr. Hauxwell's bungalow, at Taungoo, in November. Mr. W. Doherty picked up off the ground a male also in Taungoo. This species seems never to occur commonly.

14. HELCYRA HEMINA, Hewitson.

One male, Taungoo Hills, 4,000 feet, October.

15. Apatura ambica, Kollar.

Males only, from the Taungoo Hills, taken in March, and the Thaungyin Valley, Middle Tenasserim, in January and February.

16. Apatura sordida, Moore.

One male from the Ataran Valley taken in March. This species has hitherto been known only from Sikkim.

17. Eulacura osteria, Westwood.

Thaungyin Valley, March. One male. I possess another male from the Daunat Range.

18. Sephisa chandra, Moore.

Taungoo Hills, 4,000 feet, October.

19. Dichorrhagia nesimachus, Boisduval.

Daunat Range, March and April.

20. Stibochiona nicea, G. R. Gray.

Taungoo Hills, 4,000 feet, October. Specimens from Burma and the Malay Peninsula have the marginal white band on both sides of the hindwing more or less developed, in extreme specimens very greatly so, but every intergrade exists between these very white examples and the normal form. The white form has been named *S. nicea subucula* by Herr H. Fruhstorfer, from Malacca (Berl. Ent. Zeitsch., vol. xlii, p. 329 (1897).

21. Neurosigma nonius, de Nicéville.

Taungoo Hills, 4,000 feet, April and May, several examples, all males. This species was described in "Ann. and Mag. of Natural History," sixth series, vol. xvii, p. 396 (May, 1896), from Karenni, Burma, but is not mentioned by Mr. Moore, though described a year before part xxviii of his "Lep. Ind." was published. I think Mr. Moore in "Lep. Ind.," vol. iii, p. 79, &c., (1897), has confused the species of this genus. *N. doubledaii*, Westwood, was described from a female from Sylhet. I have both sexes from this locality, and they agree with others in my collection from Sikkim, Bhutan, Jorchât in Assam, and Katha in Upper Burma. Mr. Moore has figured the female of this correctly on pl. ccxviii, fig. 1*b*, but its male he describes as a new species under the name of *N. fraterna*, and figures it on the same plate, figs. 2, 2*a*. My *N. nonius* is accurately figured on the same plate, figs. 1, 1*a*, as the male of *N. doubledayi* [*sic*]. He gives Bhotan [=Bhutan], the Khasia Hills, and the Chittagong Hills for

N. fraterna, while for *N. doubledayi* he gives Sikkim, Assam, the Khasia and Naga Hills, and Burma. These localities are strangely mingled, and as far as my experience goes *N. doubledaii* is confined to Sikkim, Bhutan, Assam and Upper Burma, while *N. nonius* occurs to the southwards, in Karenni and Upper Tenasserim. The female of *N. nonius* has yet to be discovered.

22. EUTHALIA (*Zalapia*) TAOOANA, Moore.

One male of this very rare species from the Taungoo Hills, 4,000 feet, taken in May. Colonel C. T. Bingham has given me a single male captured on the ascent from the Thaungyin Valley to the Taoo Plateau at about 2,000 feet, taken 1st March, 1890.

23. EUTHALIA (*Chucapa*) FRANCIÆ, G. R. Gray.

Taungoo Hills, 4,000 feet, one male in October.

24. LIMENITIS (*Sumalia*) ZULEMA, Doubleday and Hewitson.

Taungoo Hills, 4,000 feet, October, one male.

25. ATHYMA RANGA, Moore.

As *A. ranga*, Moore, and *A. mahesa*, Moore, are seasonal forms of one and the same species, but as the former name occurs earlier than the latter in the work in which both are described, it must stand for the species. *A. ranga* is found in the Daunat Range in December, the Thaungyin Valley in May and December, and in the Taungoo Hills, 4,000 feet, in November.

26. ATHYMA SELENOPHORA, Kollar.

Daunat Range, February. Males only met with.

27. CALINAGA SUDASSANA, Melvill.

Originally described from Siam. I have specimens from the Kunlon Ferry, Salween River, N. Shan States, taken on 11th March, 1895, and Mr. Hauxwell obtained three males on the Taungoo Hills, at about 2,000 to 2,500 feet elevation, also in March.

28. PENTHEMA BINGHAMI, Wood-Mason.

I have a single male taken in the Yunzalin Valley, Middle Tenasserim, in April, Mr. Hauxwell has obtained one male in the Daunat Range, and another in the Thaungyin Valley, both in April. *P. lisarda*, Doubleday, occurs in the Chin Hills very rarely in February, while *P. darlisa*, Moore, is fairly common in high forest throughout Burma; hence all the known species of the genus occur in the province.

29. Kallima alompra, Moore.

Mr. Hauxwell obtained a single male in the Daunat Range in March, 1895. For me it is a most interesting discovery, as amongst the very many thousands of butterflies from all parts of Burma that have passed through my hands,—and I have always been looking out for a blue-banded *Kallima* from Burma,—this is the first specimen I have seen of the species from thence. Mr. Hauxwell had overlooked it, as it was in a paper envelope. On setting it I find that it agrees absolutely with males of *K. knyvettii*, mihi, from Sikkim and Bhutan, so that species falls as a synonym of *K. alompra*, as Mr. H. J. Elwes thought it would do, *vide* his remarks on *K. knyvetti* [*sic*] in Proc. Zool. Soc. Lond., 1891, p. 283, when writing about it from the Naga Hills, 5,000 feet.

30. Prothoë angelica, Butler.

Mr. Hauxwell notes that this species "Flies low, and settles low down on the trunks of trees with closed wings only two or three feet from the ground. Once frightened it never returns to the same spot."

31. Prothoë belisama, Crowley.

Originally described from "Tonghou." It occurs rarely in the Ataran Valley in March, and in the Taungoo Hills, 3,000 feet, in April, May and June. "As stated by Mr. A. R. Wallace in 'The Malay Archipelago' with regard to the very closely-allied *Prothoe calydonia*, Hewitson, this species flies high and settles high up on tree trunks with closed wings, very rarely descending to the ground. It invariably returns to the same spot when frightened off, so if its resting place is within reach, the butterfly with patience can be secured with certainty. To capture one specimen my men and I had to construct three high platforms of bamboos adjoining three trees between which a *P. belisama* continually flew backwards and forwards. After some while we managed to secure the specimen."

Family LEMONIIDÆ.

Subfamily Libythæinæ.

32. Libythea geoffroyi, Godart.

I redescribed and figured this species in the Journal of the Bombay Natural History Society, vol. v, p. 205, n. 6, pl. D, fig. 5, *male* (1890), from Syinbyudine, on the Tavoy-Siam Frontier. The form figured is the most variegated as regards coloration and markings, but every gradation exists between it and one with no markings whatever on the upperside of the forewing in the male, this plainly-marked form agreeing exactly with some I have from the island of Wetter. From my Burmese collection of this species alone it is obvious that *L. geoffroyi* is exceedingly variable. It occurs in the Ataran Valley in February and March, also in the Daunat Range; in Upper Burma it is found at Myittha in January, and in Lower Burma in Tavoy in January and March. Mr. Hauxwell notes: "Males only seen. Found always on the sand at the edge of the water sucking up the moisture. Where *L. geoffroyi* occurs the otherwise common *L. myrrha*, Godart, is never seen."

Family LYCÆNIDÆ.

33. Zarona jasoda, de Nicéville.

Three males of this rare species in the Daunat Range in March.

34. Mota massyla, Hewitson.

Daunat Range, March, one pair.

35. Tajuria maculata, Hewitson.

Taungoo, one male.

36. Charana mandarinus, Hewitson.

Taungoo Hills, 4,000 feet, April, one female.

37. Cheritrella truncipennis, de Nicéville.

Taungoo Hills, 4,000 feet, April, one male. It is very common at Lwe Long near Bhamo in Upper Burma at about 5,000 feet, in March.

38. Deudorix gætulia, de Nicéville.

Taungoo, April, one male.

Family PAPILIONIDÆ.

Subfamily Pierinæ.

39. Dercas verhuelli, van der Hoeven.

In a recent revision by me of this genus (Ann. and Mag. of Nat. Hist., seventh series, vol. ii, p. 479 (1898), I stated that no species of *Dercas* is known to occur in Central or Southern Burma. Mr. Hauxwell possesses a single male taken on the Taungoo Hills, 4,000 feet, in May, and since this another from the Chindwin Valley.

Subfamily Papilioninæ.

40. Papilio adamsoni, Grose Smith.

This species occurs apparently throughout Tenasserim, but is always rare. I have specimens from the Ataran Valley taken in March, the

Thaungyin Valley taken in the same month, and the Daunat Range taken in January.

41. Papilio noblei, de Nicéville.

In my collection from the Katha district of Upper Burma, and in Mr. Hauxwell's from Taungoo taken in March.

42. Papilio rhetenor, Westwood.

Daunat Range, February, males only.

43. Papilio arcturus, Westwood.

The Taoo Plateau, Middle Tenasserim, 4,000 feet, December.

44. Papilio palinurus, Fabricius.

Better known to Indian collectors as *P. brama*, Guérin. Widely distributed in Burma, but is always rare. Mr. Hauxwell notes: "The butterfly has the habit of bathing in shallow water in hill streams. It skims over the surface of the water like a swallow, and dips its body into the water, giving itself a shake as it comes out and then flies on again." Amongst moths, many of the *Sphingidæ* in India have a similar habit.

45. Papilio payeni evan, Doubleday.

Daunat Range, March. Not hitherto recorded south of Assam.

46. Papilio gyas, Westwood.

Mooleyit Mountain, 6,000 feet, February. Not hitherto recorded south of Assam.

47. Teinopalpus imperatrix, n. sp. Plate BB.

Habitat: Taungoo Hills, 4,000 feet, Upper Tenasserim, Burma.

Expanse: ♂, 4·4; ♀, 5·7 inches.

Description: Male. Differs from *T. imperialis*, Hope, from Sikkim, Bhutan, the Khasi Hills, and Chang-yang in Central China, in the following particulars:—Upperside, *forewing* darker green, the black ground-colour shewing through the green scales more prominently. *Hindwing* with the rich chrome-yellow discal fascia with its inner edge not encroaching on the discoidal cell, instead of reaching well into it, that portion of the fascia in the second subcostal interspace considerably longer; all the tooth-like projections on the outer margin much longer, especially those at the terminations of the second subcostal and first median nervules. Underside, *forewing* with the five black fasciæ crossing the wing much broader, especially the middle one. *Hindwing* with the discal yellow fascia broader. Female. Considerably larger than that sex of *T. imperialis.* UPPERSIDE, *both wings* much darker, all the black coloration much more prominent. *Hindwing* has the pale violet black-irrorated discal area of *T. imperialis* almost entirely replaced by a black suffused area, the black line closing the cell entirely obliterated; the chrome-yellow subanal area at least twice as broad, the outer-discal lunulated black fascia consequently placed much nearer to the outer margin; all the tails very much longer. UNDERSIDE, *both wings* with much the same differences as on the upperside.

The male of *T. imperialis* has been figured by Hope, Westwood and Staudinger, the female (as *T. parryæ**) by Hope and Westwood, and as *T. imperialis* by Doubleday and Hewitson. A reference to all these figures will bear out the distinctions between these two species detailed above. Mr. T. A. Hauxwell obtained a male in January and a female in March, and the types are in his collection.

Family HESPERIIDÆ.

48. ODINA DECORATUS, Hewitson.

Taungoo, February, one male. I possess males of this rare species from the Garo Hills of Assam taken in March, the Katha District of Upper Burma, Taungoo taken in April, and the Meplé Valley in Middle Tenasserim taken in October.

49. TAGIADES PINWILLI, Butler.

Taungoo, April and May; Daunat Range, April; Ataran Valley, March.

50. CAPRONA SYRICHTHUS, Felder.

Taungoo, June, one male. It appears to occur throughout Burma.

51. ACERBAS ANTHEA, Hewitson.

Thaungyin Valley, April, one male. I possess a male from the Daunat Range.

52. PIRDANA RUDOLPHII, Elwes and de Nicéville.

Taungoo, April, one male (striped below). This species is placed by Elwes and Edwards as a synonym of *P. hyela*, Hewitson, but is apparently distinct in both sexes. I have it from Sikkim and the Khasi Hills.

53. PIRDANA DISTANTI, Staudinger.

Taungoo, February, one male (plain below).

54. LOTONGUS CALATHUS, Hewitson.

Taungoo, February, one male agreeing with Distant's figure of the species. I have another male from the Daunat Range.

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* This name is spelt *parryiæ* by Doubleday and *porryiæ* by Kirby and Leech.

BIRDS COLLECTED AND OBSERVED AT THULL DURING FIVE MONTHS IN 1898, AND NOTES ON THEIR NIDIFICATION.

By Major R. H. Rattray.

(*Read before the Bombay Natural History Society on 28th of February*, 1899).

Having been stationed at Thull during the months February to June of this year, I have made notes of the birds observed and collected there. It may be of interest to many readers to hear from this out-of-the-way corner of India.

Thull is situated at the junction of the Kurram and Miranzai valleys, and is about 2,500 feet high. The Kurram river runs past the Fort, and a small stream joins it about a mile and-a-half below the Fort. The surrounding country is one mass of hills and broken ravines, covered with dry hill grass and stunted bushes and trees. Once away from the river there is little water.

I have added notes on the nidification of some birds that have not apparently been before found, and others little known. I have followed Oates and Blanford as the latest work, in classification and names.

1. Corvus corax (Linn.)—The Raven.

Common at all seasons. It breeds freely on the hills on ledges of rock and trees.

4. Corvus macrorhynchus (Wag.) - The Jungle Crow.

Very common and to a great extent takes the place of the common crow of India. Breeds on trees in the hills.

7. Corvus splendens (Vieill.)—The Indian House Crow.

Not common; a few birds were to be seen in the vicinity of the fort and village.

9. Corvus monedula (Linn.)—The Jackdaw.

Rare, I only saw one bird. This bird was feeding in amongst a number of *C. machrorhynchus* in newly ploughed fields.

16. Dendrocitta rufa (Scop.)—The Indian Tree-pie.

One or two birds at the base of the hills about 7 miles from Thull and only during February. I do not think the birds breed there but migrate to the hills.

24. Garrulus lanceolatus (Vigors.)—The Black-throated Jay.

I saw these birds on the higher hills near Thull, they were common on the Dargai hill during November and December, 1897.

99. Trochalopterum lineatum (Vig.)—The Himalayan Streaked Laughing Thrush.

Common during the winter on the hills up to about 7,000 feet; they breed on the hills round the neighbouring station of Parachinar. I found one nest with young there on 30th July, 1898.

105. Argya caudata (Dum.)—The Common Babbler.

Very common all the year, and breed freely.

187. Myiophoneus temmincki (Vigors.)—The Himalayan Whistling Thrush.

Common along the river bed during February and March, about which time they disappear.

285 Molpastes leucotis (Gould.)—The White-eared Bulbul.

Common during February and March, a few pairs remained to breed. I found some half a dozen nests, but the greater number leave during April.

327. Dicrurus ater (Herm.)—The Black Drongo.

This bird is hardly seen during the cold weather, but in the beginning of April appears in large numbers, and at once set about nesting operations. I noticed the same thing at Kohat during 1896.

402. Sylvia affinis (Blyth).—The Indian Lesser White-throated Warbler.

A cold weather visitant but not numerous. I shot one bird in the beginning of March.

445. Scotocerca inquieta (Cretz.)—The Streaked Scrub-Warbler.

Common on all the hills and breed freely. These birds do not come down at all into the plains, but keep entirely to the foot of the hills.

466. Prinia inornata (Sykes.)—The Indian Wren-warbler.

A few birds in the reeds along the river bed. I left before they began breeding, but from their being there in the middle of June I presume they do so.

469. Lanius lahtora (Sykes.)—The Indian Grey Shrike.

This bird, like *D. ater*, only appears in the beginning of April. I did not find it nesting but saw young birds before I left. It is not common.

473. Lanius vittatus.—The Bay-backed Shrike.

Very common in both the cold and hot weather, and breeds freely.

476. Lanius erythronotus (Vigors.)—The Rufous-backed Shrike.

This is the commonest shrike, and pairs are to be seen in every group of trees; breeds freely.

518. Oriolus kundoo (Sykes.)--The Indian Oriole.

The birds only pass through Thull. They were fairly numerous during the end of March, but by the beginning of April all had gone. They are shot in numbers by the villagers for food.

528. Pastor roseus (Linn.)—The Rose-coloured Pastor.

Pass through in vast numbers during the end of March and the first half of April. They are shot and snared in numbers by the Pathans and fetch high prices for food. Their flesh is excellent.

529. Sturnus humii (Brooks.)—The Himalayan Starling.

Not common, but a fair number may be seen any day during April and May. I searched most carefully for their nests but could not find any traces, nor do I think any breed near.

532. STURNUS MENZBIERI (Sharpe.)—The Common Indian Starling.

This is our commonest starling all through the cold season. It was found at Shinowari about 25 miles from Thull, and at the latter place till the end of April.

549. ACRIDOTHERES TRISTIS (Linn.)—The Common Myna.

Common at all seasons, and breeds everywhere in houses and holes in trees.

608. PRATINCOLA CAPRATA (Linn.)—The Common Pied Bush-Chat.

Not common, but a pair or two may be met with in a day, it stays to breed in patches of reeds near the river bed.

610. PRATINCOLA MAURA (Pall.)—The Indian Bush-Chat.

These birds appeared in great numbers, at the end of March; during April it was the commonest bird at Thull, but by the beginning of May every bird had gone. They, however, breed freely at Parachinar, 54 miles off, at an elevation of about 6,000 feet.

619. SAXICOLA CAPISTRATA (Gould.)—The White-headed Chat.

Common winter visitant. I notice that Mr. Oates says it is a constant resident in the plains of the Punjab, but I have most carefully watched this bird during the last eight or nine years at various Punjab stations but have never seen a single specimen during the hot season. My experience is they disappear in the beginning of May and return to their usual places in October. I searched all the hill sides round Thull during May and could not find them. In July at Parachinar they were common and breed freely. I saw numerous young birds about.

625. SAXICOLA ISABELLINA (Cretz.)—The Isabelline Chat.

Common in winter; a few birds however remain to breed. I was lucky enough on 7th June, 1898, to find a nest with two eggs; unfortunately the native with me handled the nest rather roughly, before I could stop him. I left the nest three days in hopes of more eggs being laid, but I found it deserted; I, however, saw the bird originally fly off the nest. The nest was a neat cup of grass under a stone with a deep egg cavity lined with finer grasses; eggs, two, of a clear pale blue, marked all over with rusty red spots like dried blood; shape, long narrow ovals slightly pointed at the small end; elevation about 4,000 feet. These birds breed freely at Parachinar about 5,700 feet. I found a second nest in a similar situation with young ready to fly on 24th July, 1898.

628. SAXICOLA CHRYSOPYGIA (De Fil.)—The Red-tailed Chat.

Appears in Thull about the middle of May and is fairly common. On 25th May, 1898, I saw a pair of birds building, and on 2nd June I visited the nest, and found four fresh eggs, which I took, shooting the female. I have already described nest and eggs in a note in this journal. I subsequently found other nests. These birds do not seem particular as to situations. The first nest was in a dense wild olive bush, about 18 inches from the ground; another, on the

6th June, 1898, was on a stump of a thorny bush about 2 feet from the ground, a third, on 12th June, was on a flat bough of a thorny tree about 4 feet from the ground, while three nests were on the ground under roots of the dwarf palm—all the nests were similar, the general number of eggs three, the greatest number being four.

638. CHIMARRHORNIS LEUCOCEPHALUS (Vig.)—The White-capped Redstart.

I did not find this bird at Thull itself, but saw one specimen at Shinowari, 26 miles distant, and about the same elevation, in January. It was in a nulla with a small stream running through it, the sides covered with ferns.

661. THAMNOBIA CAMBAYENSIS (Lath.)—The Brown-backed Indian Robin.

Common at all seasons and breeds freely. The eggs found were all very highly coloured, one clutch being a distinct green with large reddish-brown blotches, especially at large end.

722. PLOCEUS BENGALENSIS (Linn.)—The Black-throated Weaver-bird.

Appeared suddenly about beginning of June, in all the reed patches on river banks; they fly about in flocks of 20 to 30 birds. On 25th June, 1898, I found a nest containing three eggs much incubated. There were at the same place numerous nests in various state of completion, all attached to reeds.

734. UROLONCHA MALABARICA (Linn.)—The White-throated Munia.

Not common, but a few birds are occasionally met with; they breed at Thull. I found one nest with four eggs incubated in the beginning of May.

738. SPORÆGINTHUS AMANDAVA (Linn.)—The Indian Red Munia.

A few flocks of these birds are to be met with on the jheels near the river, also in the high grass on cliffs above the river. I did not see any after the beginning of April.

775. GYMNORHIS FLAVICOLLIS (Frankl.)—The Yellow-throated Sparrow.

Rather rare. I only saw 3 pairs, and those during May. They were evidently breeding, as I saw a female with some cotton in her bill but could not see where she went.

776. PASSER DOMESTICUS (Linn.)—The House Sparrow.

As common and as great a nuisance as in the rest of India.

779. PASSER MONTANUS (Linn.)—The Tree Sparrow.

During March these birds passed through in thousands, and all from these parts appear to go to the Upper Kurram Valley to breed. I found 20 and 30 nests in every house and verandah in Parachinar in July.

804. CHELIDON URBICA (Linn.)—The Martin.

Rare. On the evening of 14th May, 1898, I saw some 7 or 8 birds flying round the edge of a jheel near the Kurram river. I shot one, a male, testes much enlarged; they probably breed in some of the higher hills near. On the 17th all birds had gone.

809. COTILE SINENSIS (J. E. Gr.)—The Indian Sand Martin.

Very common and breed in hundreds along the river bank. By 10th March almost all nests I opened out had young, in one or two very hard-set eggs.

811. PTYONOPROGNE CONCOLOR (Sykes.)—The Dusky Crag Martin.

Common at all seasons and breed in hills near. I did not get their eggs, owing to the hills they retire to being across the river and border, thus forbidden ground.

813. HIRUNDO RUSTICA (Linn.)—The Swallow.

This is the commonest swallow here, and is a permanent resident ; breeds freely in houses and buildings in the village of Thull during April. I obtained numerous eggs.

818. HIRUNDO SMITHII (Leach.)—The Wire-tailed Swallow.

Common all the year, and breeds.

823. HIRUNDO ERYTHROPYGIA (Sykes.)—Sykes's Striated Swallow.

Great numbers arrived about 10th May, and remained till about 20th May; all seem to go to Upper Kurram to breed. During their stay the whole country seemed alive with this bird, *H. rustica* and *Cypselus apus.*

831. MOTACILLA MADERASPATENSIS (Gmel.)—The Large Pied-wagtail.

Common, in winter a good number of birds remain to breed.

832. MOTACILLA MELANOPE (Pall.)—The Grey Wagtail.

Rare. I saw some four birds during April apparently passing through.

847. ANTHUS RUFULUS (Vieill.)—The Indian Pipit.

Common during the cold weather. I did not observe any breeding or about later on in the year.

871. MIRAFRA ERYTHROPTERA (Jud.)—The Red-winged Bush-lark.

Rare. I only saw one pair in the end of April. They evidently had a nest near, but I failed to find it.

874. GALERITA CRISTATA (Linn.)—The Crested Lark.

Very common. During March great numbers arrived and commenced pairing. I took numerous nests with eggs during April and the early part of May. This part of India appears to be a great breeding ground, as there were not very many birds during January and February.

878. AMMOMANES PHŒNICUROIDES (Blyth.)—The Desert Finch-Lark.

Rather rare. I only saw some 8 or 9 birds in a rather extended search for them. I failed to find a nest.

895. ARACHNECHTHRA ASIATICA (Lath.)—The Purple Sun-bird.

Common all through the hot weather ; arrived in May ; breed freely.

963. DENDROCOPUS SINDIANUS (Blanf.)—The Sind Pied Woodpecker.

This is the only woodpecker found near Thull ; in the hills saw one other species, but was unable to identify it. The bird is numerically not rare, but few birds were seen. I obtained 2 eggs, on point of hatching out from a hole in a mulberry tree on 20th April, 1898, shooting the female.

1024. CORACIAS GARRULA (Linn.)—The European Roller.

This bird is decidedly migratory in these parts. There was not a single bird to be seen during the cold season. About 10th May they began to arrive in large numbers and remained to breed. I found nests in holes in cliffs during June.

1026. MEROPS VIRIDIS (Linn.)—The Common Indian Bee-eater.

Not by any means a common bird near Thull. A few couples were observed breeding in May and young birds were about by the end of June.

1027. MEROPS PHILIPPINUS (Linn.)—The Blue-tailed Bee-eater.

Very rare here. I only saw one pair in the beginning of June. I do not know whether they remained to breed, as I did not see them again, but think they were merely passing through.

1033. CERYLE VARIA (Strickl.)—The Indian Pied Kingfisher.

Common and breeds freely on river banks in March; at the end of April young birds were numerous.

1035. ALCEDO ISPIDA (Linn.)—The Common Kingfisher.

Not common here, as far as I observed there were five pairs near Thull. I found one nest-hole containing five young birds in the end of May. The others were also breeding. Permanent residents.

1044. HALCYON SMYRNENSIS (Linn.)—The White-breasted Kingfisher.

This is the common Kingfisher in these parts. They were found on every part of the river, are permanent residents. I obtained eggs at end of April.

1067. UPUPA INDICA (Reich.)—The Indian Hoopoe.

Common everywhere where there were trees, and near villages. Permanent resident, breeds during April.

1068. CYPSELUS MELBA (Linn.)—The Alpine Swift.

A rare bird, I only saw 3 birds at the beginning of May, of which I shot one.

1069. CYPSELUS APUS (Linn.)—The European Swift.

On the 12th May I observed these birds in large numbers flying with swallows over cornfields near the river—they kept very high. I with difficulty obtained two specimens—by the 15th of the month all had disappeared. They undoubtedly breed in higher hills near as occasionally of an evening, up to end of June, I saw one or two birds fly rapidly over. They are numerous now in the high Safedkoh range near Parachinar at the end of July.

1073. CYPSELUS AFFINIS (Gray and Hardw.)—The Common Indian Swift.

Rare. I only saw one pair early in May. This pair kept near the Fort three or four days and then disappeared. Breeding here doubtful.

1089. CAPRIMULGUS MAHRATTENSIS (Sykes.)—Sykes's Nightjar.

Fairly numerous. The birds are not permanent residents, but arrive about middle of May with *C. europæus*. I always found this species on the open hill sides and not amongst jungle. They breed in the more open nullas during June and July. I obtained four nests with eggs, the female in each case being shot on leaving the eggs. I notice that the eggs of this species can readily be distinguished from those of *C. europæus* by being more spotted, not marbled, each spot being distinct, and having less gloss.

1090. Caprimulgus monticola (Franklin.)—Franklin's Nightjar.

Common and a permanent resident. I found it breeding plentifully; all the eggs I procured, from five nests, were laid without any depression and extremely highly coloured, all being almost a brick-red.

1092. Caprimulgus europæus (Linn.)—The European Nightjar.

Very common. They arrive about the middle of May, and almost every wooded nulla contained a pair—this is the commonest nightjar here. Breed freely during June and July; I obtained 10 nests with eggs all laid under a bush in a depression scraped by the bird. The eggs are all much mottled and marbled with two shades of brown, a light sepia overlaying the dark markings and being equally numerous. I find all the nightjars lay much later here than in other parts; I did not find a single egg until the beginning of June, and most were found at the end of June and beginning of July.

1168. Bubo bengalensis (Blyth.)—The Rock Horned Owl.

Rare, I only saw one pair in June. A nearly fully fledged young one was brought in for sale about the same time.

1182. Athene bactriana (Blyth.)—Hutton's Owlet.

Not uncommon. I saw several pairs living in holes in cliffs, shooting one male. A pair was brought in for sale, but as they would not eat in confinement, I released them. In one hole I found some broken egg shells, so know they breed here about March I think.

1192. Gyps fulvus (Gm.)—The Griffon Vulture.

Common in the hills, I did not see any in the lowlands. On the Dargai hill they were very numerous and breed on the cliffs there and the Samana range.

1196. Pseudogyps bengalensis (Gm.)—The Indian White-backed Vulture.

Common on the plains round Thull, they were feeding on the dead transport animals all along the road from Kohat to Thull.

1198. Neophron percnopterus (Linn.)—The Egyptian Vulture.

This is the common scavenger vulture up here. It is found round every camp and village as in other parts; breeds in the hills on ledges of rock in May.

1199. Gypætus barbatus (Linn.)—The Bearded Vulture or Lammergeyer.

Very common, the birds round here grow to a very large size—a female I measured was just under 7 feet across the wings and body. Breed during January on inaccessible cliffs. I notice that Blanford remarks that it is doubtful whether it attacks living prey or not. I myself saw a pair, some years ago, at Kajuri Kach, trying to knock a young Markhor off a ledge on a deep precipice. One or other bird repeatedly swooped down on the young one which was protected by the females of the herd.

1203. Aquila vindhiana (Franklin.)—The Indian Tawny Eagle.

Common. I saw it frequently feeding on the bodies of dead ponies and camels in company with vultures.

1227. POLIOÆTUS HUMILIS (Brooks.)—Hodgson's Fishing Eagle.

Rare, I only saw one bird, it was daily fishing in the Kurram river. It is a permanent resident; one pair breed annually at Hangu about 30 miles distant. A large white egg was brought in to me that can only belong to this species. I saw it daily at Thull working up and down the river but never once saw it catch a fish.

1229. MILVUS GOVINDA (Sykes.)—The Common Kite.

Exceedingly common at all times round the Fort and villages near.

1230. MILVUS MELANOTIS (Temm.)—The large Indian Kite.

Rare. I only saw one pair on a hill about five miles off. I shot the female off a nest with two partly incubated eggs on the 5th May. Nest like that of *M. govinda*, but larger.

1247. ACCIPITER NISUS (Linn.)—The Sparrow-Hawk.

A bird or two occasionally came down from the hills, it is not a resident as far as I could see. It breeds on the cliffs of the Safedkoh range not far distant, one young bird in down was brought in to the Political Officer, Kurram, at Parachinar, early in July.

1255. FALCO PEREGRINATOR (Sundw.)—The Shahin Falcon.

Common along the foot of the hills, and are often seen hawking doves in pairs. They breed in the near hills, one pair annually having its nest on a precipice near Dargai, and a second on a hill called Mir Quali about 15 miles distant. I have not been able to procure the eggs.

1265. TINNUNCULUS ALAUDARIUS (Linn.)—The Kestrel.

Common and a permanent resident, one pair had their nest and hatched their young on a high cliff about a mile from the Fort, and a young one was brought in to me at the end of May.

1292. COLUMBA INTERMEDIA (Strickl.)—The Indian Blue Rock-pigeon.

Common during the cold weather. They were breeding in hundreds on a high cliff near the Fort. About the middle of April they all disappeared suddenly. I did not know before that this pigeon was in any way migratory, but here it seems to be so.

1293. COLUMBA LIVIA (Bonnatent.)—The Blue Rock-pigeon.

During January and February these birds were in large numbers, flying about the fields in large flocks. I cannot say when they left, as I did not go in the direction they were to be found between February and the end of March.

1309. TURTUR CAMBAYENSIS (Gm.)—The Little Brown Dove.

This is our commonest dove and found all over the country, breeds freely in low stunted trees and bushes from March to June.

1310. TURTUR RISORIUS (Linn.)—The Indian Ring Dove.

Common but not so much so as the last, it is found in the same places, is a permanent resident, and breeds freely.

1311. Œnopopelia tranquebanca (Herm.)—The Red Turtle Dove.

Decidedly a rare bird here, I only saw four birds during the five months, but more may have escaped my notice mixed up with other doves.

1316 Pterocles arenarius (Pallas.)—The Large or Black-bellied Sand-grouse.

A bird of passage only. They arrived at the end of March and passed on immediately. We only shot a few birds. They all went up the Kurram Valley into Afghanistan.

1355. Coturnix communis (Bonn.)—The Grey Quail.

These birds do not arrive in the usual large numbers in spring and autumn. The greatest number shot by one gun in April was twenty birds. A few are to be found at all times of the year and breed. I procured a nest with four eggs slightly incubated on 21st April. The nest was in a wheat field under a tuft of grass.

1370. Caccabis chukor (Gray.)—The Chuker.

Very common all round, are permanent residents and breed. This year, owing to early heat, they began breeding very early and many eggs were spoiled, three addled eggs were brought to me on 6th March. The natives here have a curious method of catching them. A call bird (a cock) is placed in the centre of a patch of grass in a cage, all round are placed numerous horse-hair nooses. On shaking the cage the decoy commences calling; the challenge is taken up and other birds run in towards him, and are caught in nooses.

1371. Ammoperdix bonhami (Gould.)—The Seesee.

Common, but not very, in all the low hills and ravines round. It is a permanent resident. I procured one nest with seven slightly incubated, and a second with four, fresh eggs in May. I consider them the best partridge we have for eating, the flesh is not so dry and tasteless as the others.

1372. Francolinus vulgaris (Steph.)- The Black Partridge.

Very common all round and breed freely in the dwarf palm patches. They afford excellent sport as the jungle is not too high.

1375. Francolinus pondicerianus (Steph.)—The Grey Partridge.

Very common and breed freely with *F. vulgaris*. Out of about twenty nests I examined, only two contained nine eggs, all the remainder without a single exception contained eight. Most of the nests were found in May; at the end of June all old birds had fairly grown chicks larger than the quail running with them.

1393. Porzana pusilla (Pallus.)—The Eastern Baillon's Crake.

These birds arrived in great numbers during the end of May and the first week in June, but all seemed to pass on, as before I left I frequently searched the reed beds and did not flush a single bird.

1407. Grus communis (Bechst.)—The Common Crane.

During April this bird with No. 1411 passed over Thull in countless numbers going up the Kurram Valley. They flew high and did not as a rule rest near. Often after a severe storm up the Valley they were driven back.

1411. Anthropoides virgo (Vieill.)—The Demoiselle Crane.

Passed through in great numbers in April. I shot one out of a flock early in the month, but usually they flew too high.

1427. Glareola lactea (Temm.)—The Small Indian Swallow-Plover.

Common at all seasons along the river. Bred freely on the stony islands in the river during April. In May I found numerous unfledged young ones unable to fly, they all possessed a remarkable facility for concealing themselves, and in many instances I only found them through my dogs.

1431. Sarcogrammus indicus (Sharpe.)—The Red-wattled Lapwing.

Very common everywhere along the river, but more seem to come in during April and breed freely. One nest I found was in rather a curious place : it was on the highest point of a hill, a good 300 feet above the water, and was made of a lot of small pieces of stone put together.

1436. Vanillus vulgaris (Bechst.)—The Lapwing or Peewit.

Not common and only found when passing through. During heavy wind and rain in February I saw one flock (about twenty birds), and shot two.

1437. Chettusia gregaria (Bonap.)—The Sociable Lapwing.

During April large flocks of these birds passed up the Kurram Valley. They usually stayed a day or two near the river before passing up. I must have seen about 300 passing one day.

1447. Ægialitis dubia (Blyth.)—The Little ringed Plover.

Very common, and a permanent resident. These birds are generally found in small flocks of five to eight birds all along the river, but separate at the beginning of May. On 21st May I shot a female with an egg ready for expulsion, and a few days later found a nest with four eggs. Nest—a small depression scraped among the pebbles in the bed of the river. This year owing to the numerous floods many nests must have been destroyed. Eggs were of two distinct types : one a pale sea-green profusely speckled with dark purple, and the second a stone-colour speckled with almost black-purple.

1460. Totanus hypoleucus (Temm.)—The Common Sandpiper.

A common cold weather visitant everywhere near water. All had left by the end of May, about which date I shot one or two, but they showed no signs of breeding.

1482. Scolopax rusticola (Linn.)—The Woodcock.

A rare winter visitant. One was shot a few miles up the Kurram river about Christmas time.

1484. Gallinago cœlestis (Dresser.)—The Common Snipe.

Common on the marshes near the river during March. They are then passing up the Kurram Valley.

1487. Gallinago gallinula (Blyth.)—The Jack Snipe.

Common at the same time and the same places as the last. These birds, if anything, arrive slightly earlier.

1488. Rostratula capensis (Veill.)—The Painted Snipe.

Very rare. I was in the marshes daily during February and March and only saw one bird, which we shot—a female. This was about the middle of March. One bird was also shot higher up the Kurram Valley.

1498. Hydroprogne caspia (Kaup.)—The Caspian Tern.

Very rare. I only saw one party of seven birds on the 22nd May, 1898, and shot one. They had evidently been blown down by a severe rain and wind storm.

1499. Sterna anglica (Mont.)—The Gull-billed Tern.

A bird of passage during March. They were common during that month all along the river, but all had left before the end of the month.

1527. Phalacrocorax fuscicollis (Steph.)—The Indian Shag.

Very rare. I shot one bird, the only one I saw, in February. It was diving and feeding in a small back-water after severe rain up the Kurram Valley.

1545. Platalea leucorodia (Linn.)—The Spoonbill.

Rare. I only saw them on one occasion, a flock of, perhaps, fifty birds flew over me while I was fishing at the end of May. I followed them up and shot one bird.

1555. Ardea cinerea (Linn.)—The Common Heron.

Not numerous, but a bird or two was to be seen at all seasons near the river; they were there at the end of June, so I presume they breed somewhere near.

1559. Herodias alba (Blyth.)—The Large Egret.

Rare and only a passenger. A few birds appeared about the middle of May for a day or two; one was shot and brought in to me, it was in splendid breeding plumage.

1568. Nycticorax grisens (Blyth.)—The Night Heron.

A rare but, I presume, permanent resident. A party of five or six birds used to fly over the Fort every evening about sunset the whole time I was there.

1574. Botaurus stellaris (Blyth.)—The Bittern.

A very rare winter visitor. One was shot while we were snipe-shooting at the end of March, it was in a dense bed of reeds six feet high.

1588. Casarca rutila (Bonap.)—The Ruddy Sheldrake.

A rare visitor; I only saw six birds the whole time. Four of them stayed over a week on the river during April.

1592. Anas boscas (Linn.)—The Mallard.

Common during March, on the river; they were then on their way to their breeding-grounds.

1595. CHAULELASMUS STREPERUS (Bonap.)—The Gadwall.

Common during passage with other ducks during March, one male was shot out of a party of three in June and brought in to me.

1597. NETIUM CRECCA (Kaup.)—The Common Teal.

Very common during February and March, numbers were shot daily on the river.

1600. DAFILA ACUTA (Blyth.)—The Pintail.

I saw only one flock of about a dozen of these ducks in March, they were flying too far for a shot. They seem to be a rare duck in these parts.

1602. SPATULA CLYPEATA (Boie.)—The Shoveller.

Common during February and March with other duck. Many were shot by the natives.

1604 NETTA RUFINA (Kaup.)—The Red-crested Pochard.

A few of these pochard were occasionally to be seen in March with other duck, but not common.

1612. MERGUS ALBELLUS (Linn.)—The Smew.

Rare. I saw two birds in the beginning of February, of which I shot one, a female. They were in a small back-water of the river.

The above list is of course very incomplete owing to the small amount of time I could devote to collecting, also the disturbed state of the country. I saw numerous Warblers which I was unable to satisfactorily identify, as well as many water birds. It was most interesting to watch the migration of the various birds, and the time of their stay. The various duck only stayed a very short time, and owing to every man being armed, and continuous firing all day long, I undoubtedly missed seeing many species. The number of Western species found here was also interesting, more so as I was fortunate enough on one or two occasions to find their nests and eggs.

DESCRIPTIONS OF SOME NEW OR RARE TREES FROM TRAVANCORE.

By T. F. Bourdillon, f.l.s., Conservator of Forests, Travancore.

[*With* 6 *Plates.*]

[*Read before the Bombay Natural History Society on 7th December*, 1898.]

Guttiferæ.

Garcinia Imberti, sp. nov. Plate I.

A medium sized tree. Leaves simple, opposite, entire, dark green, elliptic or lanceolate, acuminate, base narrowed, 1½ to 3 inches long by ½ to 1¼ broad. Petiole $\frac{1}{10}$ inch. Inflorescence diœcious, terminal, the male flowers 3, 6 or 9 together at the ends of branchlets: the female flowers borne singly or in pairs. Male flowers $\frac{1}{6}$ inch diameter: female flowers ¼ inch, yellow, succulent, and sessile. Calyx and corolla of both sexes 4-lobed, much imbricated. Stamens of the male flowers in a globose central mass, about 16. Staminodes in the female flowers about 16 in a ring surrounding the ovary. Stigma broad, sessile, convex. Ovary 2-celled, ovules solitary in each cell. Fruit about 1 inch long and broad and ½ inch thick, consisting of one or two seeds enclosed in a leathery covering.

An evergreen tree 30 to 40 feet high with a stem 1 foot in diameter. Bark brown and white, smooth, ¼ inch thick. Juice thin, sweet-scented. Wood yellowish-grey, very hard, but liable to split. Pores medium to small, scanty, evenly distributed. Medullary rays indistinct, annual rings not visible. No heart. Weight 56 lbs. to the cubic foot. Value of P.=685.

Fairly common in the evergreen forests of South Travancore above 3,000 feet elevation, but very local.

Description of Plate I—

1. Branch of male tree.
2. Branch of female tree.
3. Column of stamens in male flower × 4.
4. Ovary of the female flower × 4.
5. Fruit—natural size.

Meliaceæ.

Dysoxylum purpureum, sp. nov. "Kār agil." Plate II.

A very large tree. Leaves pinnate, about 15 inches long: leaflets 7 to 11, subopposite or alternate, narrowly ellliptic, dark green, acuminate, 5 to 8 inches long by 1½ to 3 broad, glossy, veins 9 to 10 pair, conspicuous beneath: petiolules ¼ inch. Inflorescence in terminal and leaf opposed, small panicles or spikes appearing in February to April. Flowers about $\frac{3}{8}$ inch long, hermaphrodite, pedicels $\frac{1}{8}$ inch. Calyx 4-lobed, green fleshy, lobes obtuse. Petals 4, fleshy, buff-coloured. Staminal column tubular, mouth crenulate: anthers 8, large, included. Style equalling the column, thick, fleshy. Stigma large, appearing above the column. Disk cup-shaped, toothed. Ovary 4-celled. Fruit, a smooth round capsule 2 to 3 inches in diameter, ripening about October, seeds 3 to 4, large. A very large evergreen tree, up to 100 feet high and 3 feet in diameter, fairly common in the forests of the Ravi river from 1,000 to 2,000 feet, but very local, somewhat resembling *D. malabaricum* but leaves darker, broader and softer.

Bark pale, smooth, wood reddish-brown, hard, not scented. Pores small, evenly distributed. Medulary rays crossed by irregular bands of white tissue. Annual rings marked by dark lines, but not distinct, 6 to an inch.

Weight 52 lbs. per cubic foot. P.=708.

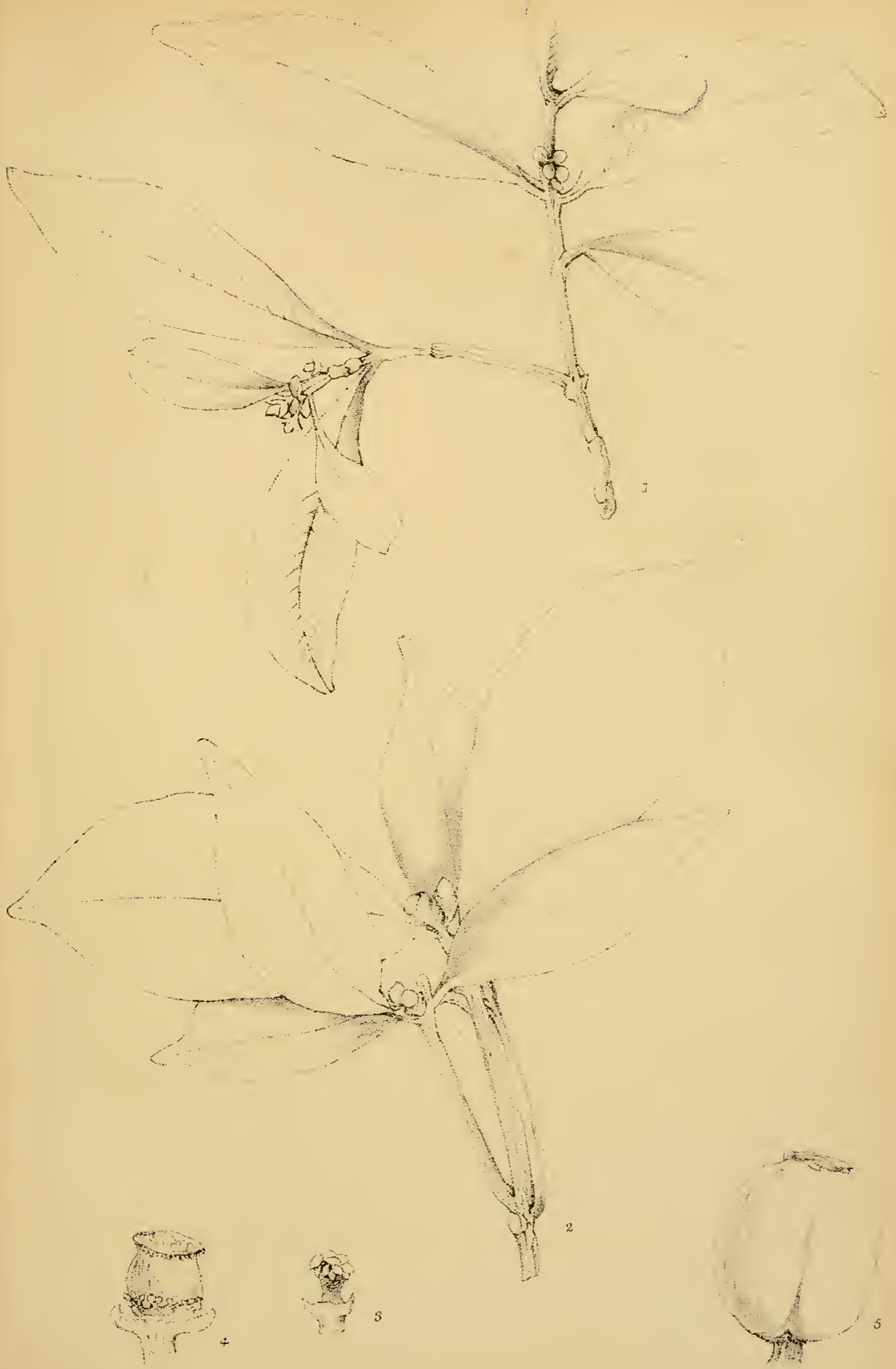
Description of Plate II—

1. Flowering branch with leaves.
2. Flowering branch.
3. Fruit—natural size.
4. Flower × 4.

Aglaia maiæ, sp. nov. Plate III.

A medium-sized tree. Leaves alternate, pinnate, from 1 to 2 feet long. Leaflets 9 to 13, opposite and alternate, pale when young, very glossy and dark green when old, elliptic, acuminate, quite entire, sides often unequal, obscurely penniveined with about 15 pairs of veins, 4 to 9 inches by $\frac{1}{2}$ to $2\frac{1}{2}$. Petiolules $\frac{1}{3}$ to $\frac{1}{2}$ inch. Inflorescence in terminal lax panicles, 8 to 15 inches long. Flowers polygamo diœcious, small, globose, honey-scented, about $\frac{1}{8}$ inch long by $\frac{1}{12}$ inch broad, almost sessile, yellowish. Calyx 5-lobed, imbricate. Petals 5, concave, imbricate. Staminal tube subglobose, obscurely 5-toothed : anthers 5, large, sessile, included. Ovary 2-celled, style very short. Fruit, a fleshy berry, buff-coloured, downy, globose, $\frac{3}{4}$ inch in diameter, containing one large seed.

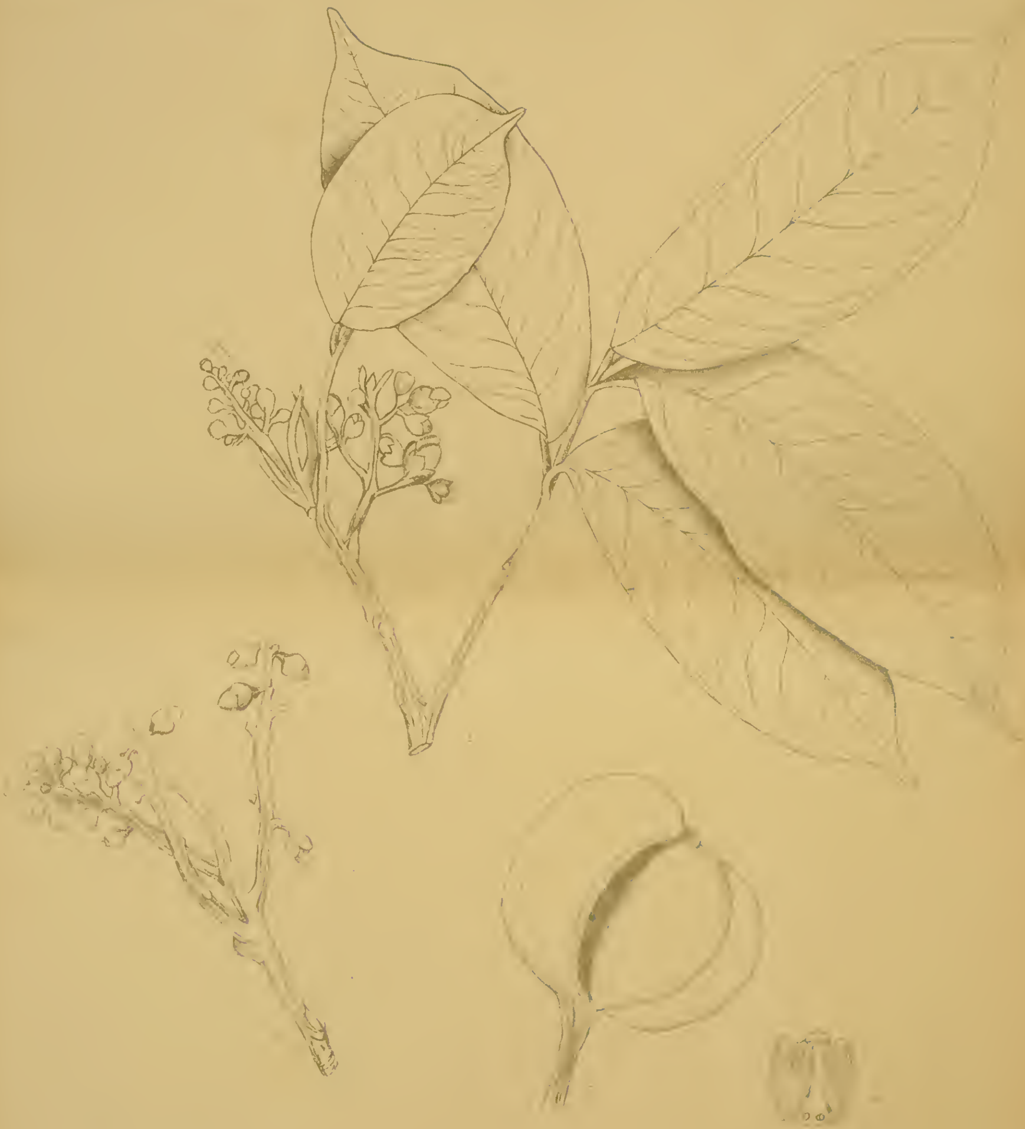
An evergreen tree found in the forests about Ariyaukam and Colatoorpolay from 500 to 1,500 feet. Flowers in May and June. Fruit ripens in August and September.



M. M. Bourdillon. delt.

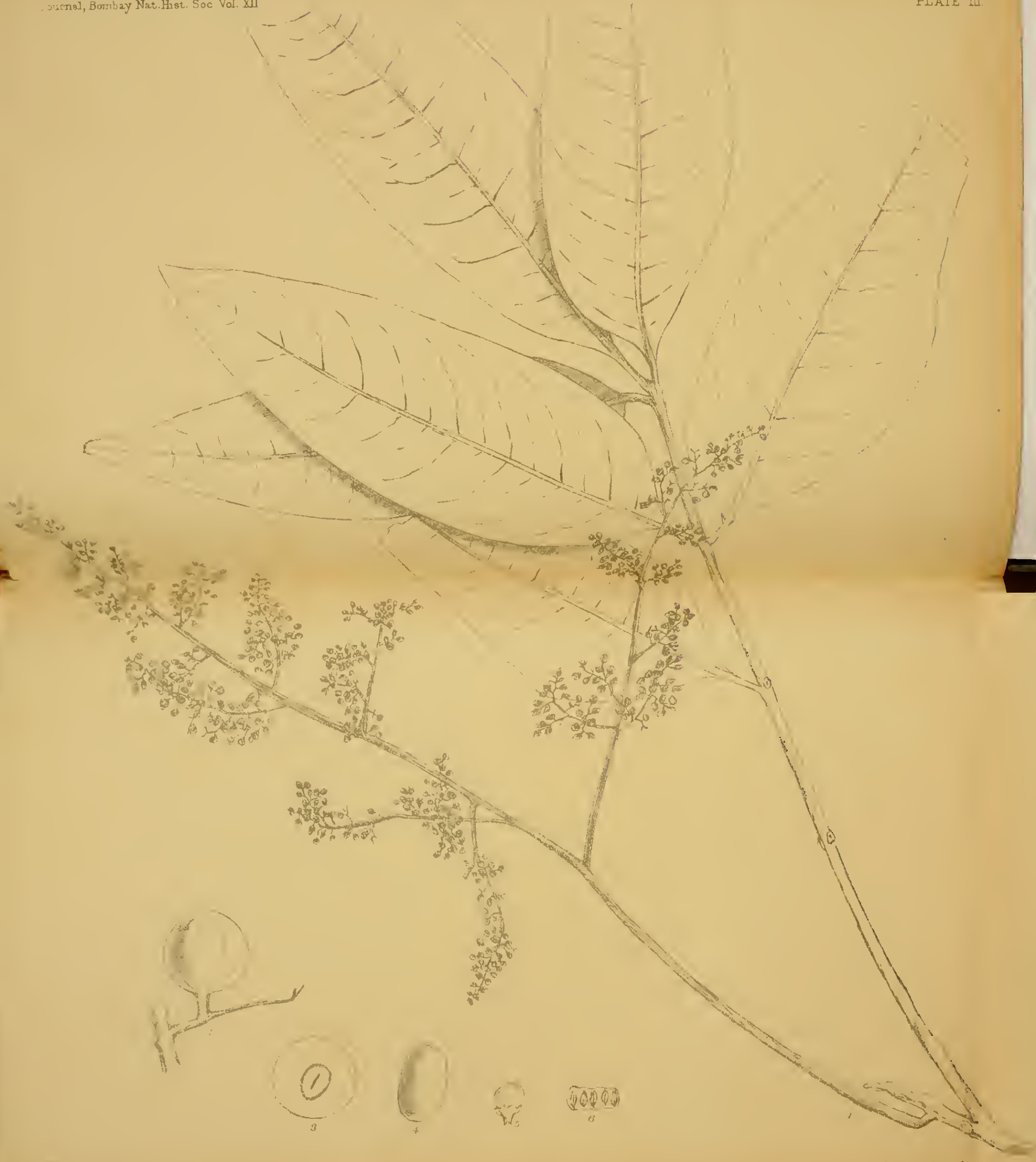
Lith by Chitra Silpi Cº

GARCINIA IMBERTI, Bourdillon.



DYSOXYLUM PURPUREUM, Bourdillon.

PLATE III.



T. F. Bourdillon. Delt.

K. D. Chandra Lith.

AGLAIA MALÆ, Bourdillon.

Bark mottled brown and white, rather smooth, ¼ inch thick. Wood moderately hard, very fragrant, pale brown, very strong, medullary rays fine, numerous. Pores medium-sized. Annual rings indistinct. No heart.

Weight 70 lbs. per cubic foot. P.=1061.

Description of Plate III—

1. Flowering branch with leaves.
2. Fruit—natural size.
3. Section of fruit—natural size.
4. Seed—natural size.
5. Staminal tube × 4.
6. Do. showing stamens × 4.

COMBRETACEÆ.

Terminalia angustifolia, Roxb. "Pei kadakkay" "Sula maruthu." Plate IV.

Leaves simple, alternate, or subopposite, entire, narrowly elliptic to lanceolate, accuminate, glabrous, pale green, 2 to 4 inches by 1¼ inch. Venation pellucid. Petiole ½ to ¾ inch. Flowers small in terminal and axillary panicles, hermaphrodite ; each flower about ⅙ inch diameter, cream-coloured, sessile. Calyx 5-cleft, tomentose. Petals none. Stamens 10, much exserted, filaments long. Style simple. Ovary 1-celled with 2 or 3 ovules. Fruit a drupe about ¾ inch long and ½ inch broad, brown mottled with white, containing one 5-angled stone.

A very large tree found in the evergreen forests about Colatoorpolay, Ariyaukam and Acchankovil, allied to *T. chebula*, but very different to it in appearance, and found in evergreen forests, whereas *T. chebula* occurs only in the deciduous grass forests. The fruit also is very much smaller. Flowers in May and June. Fruit ripens in January.

Bark pale brown, smooth, ¼ inch thick. Heart-wood small, brown, sap-wood yellowish-white, thick. Wood moderately hard, very good ; fibre long, fine, and straight.

Weight 51 lbs. per cubic foot. P.=1012.

This tree was seen by Roxburgh, who found it in Travancore, but C. B. Clarke in "Flora Britannica Indica," ii, 449, regards it as a doubtful species, which it certainly is not.

Description of Plate IV—

1. Flowering branch with leaves.
2. Panicle of flowers—natural size.
3. A flower × 4.
4. The ovary × 4.
5. Fruit—natural size.

RUABICEÆ.

Canthium pergracile, sp. nov. "Palaga." Plate V.

Leaves opposite, simple, entire, narrowly elliptic, acuminate, narrowed to the base, dark green, very glossy; veins conspicuous but distant; size 2 to 3 inches by $\frac{3}{4}$ to 1 inch; petiole $\frac{1}{16}$ to $\frac{1}{4}$ inch; stipules small, acute. Flowers hermaphrodite, small, in axillary cymes, 10 to 20 together, yellowish-green, $\frac{1}{4}$ inch long and broad, pedicels slender, $\frac{1}{4}$ inch long. Calyx 5-lobed, lobes very short, corolla campanulate, lobes 5, valvate; reflexed; throat villous. Stamens 5, alternate, with petal inserted between them, filaments short, anthers large. Style very long, stigma large, capitate. Ovary 2-celled, with 1 ovule in each cell. Fruit a drupe, dark green and smooth, from $\frac{3}{4}$ to 1 inch long and broad, and containing 2 hard pyrenes.

A very graceful tall tree; up to 80 feet high and $1\frac{1}{2}$ foot in diameter, unarmed, found in the evergreen forests near Colatoorpolay at an elevation of 500 feet or so. Flowers in February: fruit ripens in August and September.

Bark light brown, rather rough, $\frac{1}{4}$ inch thick. No heart, wood pale brown, straight grained, moderately hard. Pores small and numerous. Medullary rays fine. Annual rings marked by dark lines about 16 to inch.

Weight 48 lbs. per cubic foot. P. = 870.

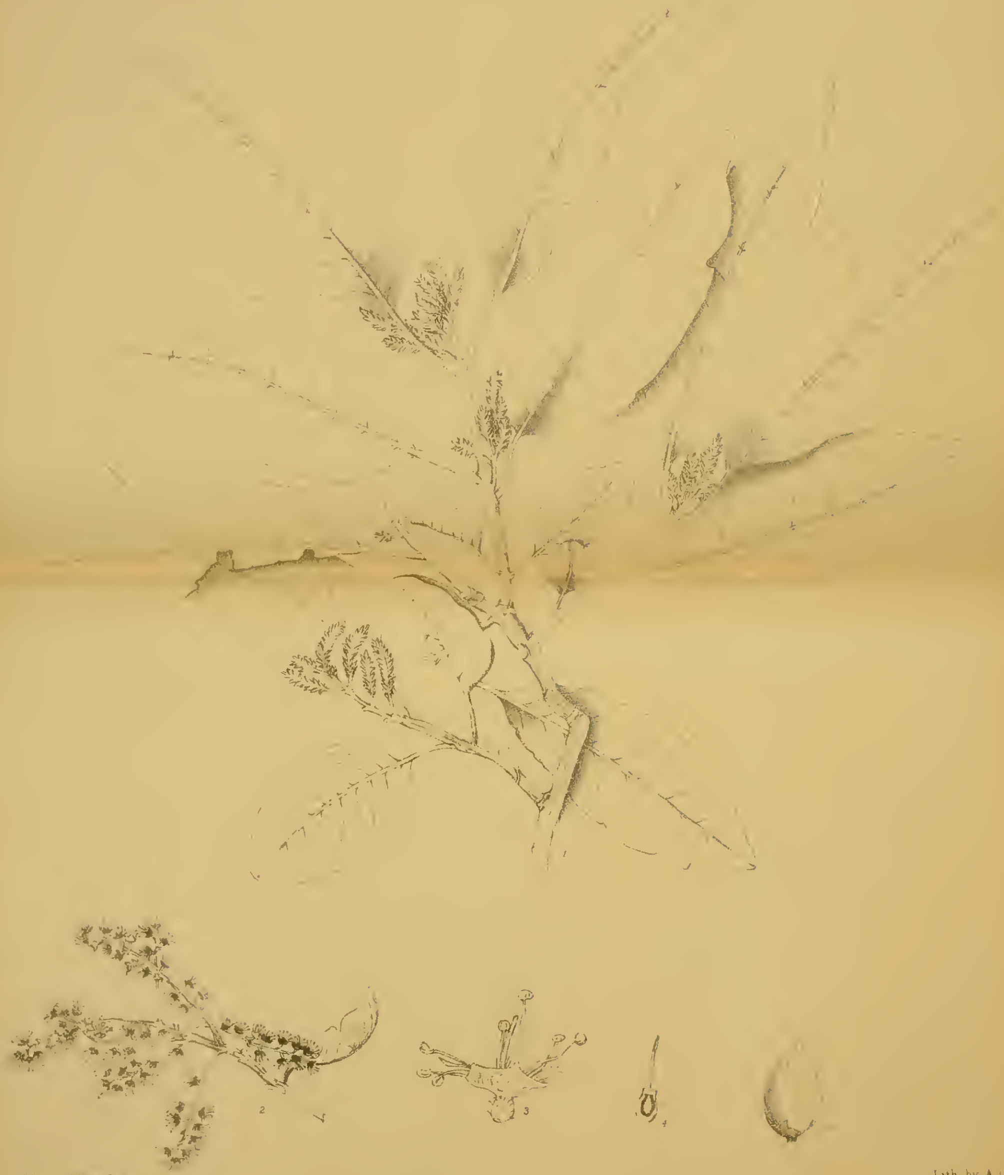
Description of Plate V.—

1. Flowering branch—natural size.
2. Flower × 4.
3. Ovary × 4.
4. Section of fruit—natural size.
5. Fruit—natural size.

EBENACEÆ.

Diospyros humilis, sp. nov. "Vellei thuvarei." Plate VI.

Leaves simple, alternate, entire, narrowly elliptic, acuminate. 1 to 3 inches by $\frac{3}{4}$ to 1 inch, glabrous above, veins indistinct. Petiole



M M Bourdillon del

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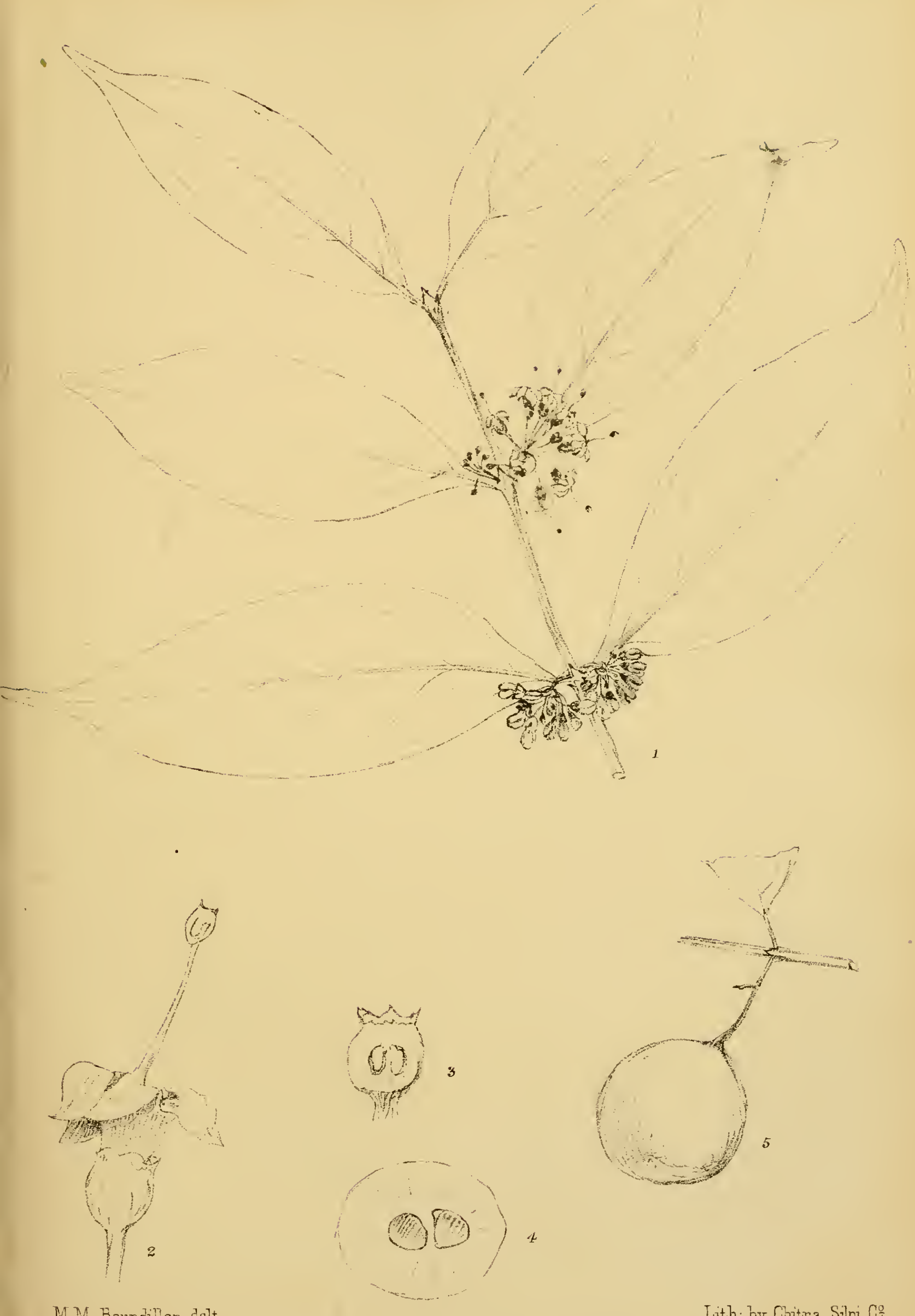
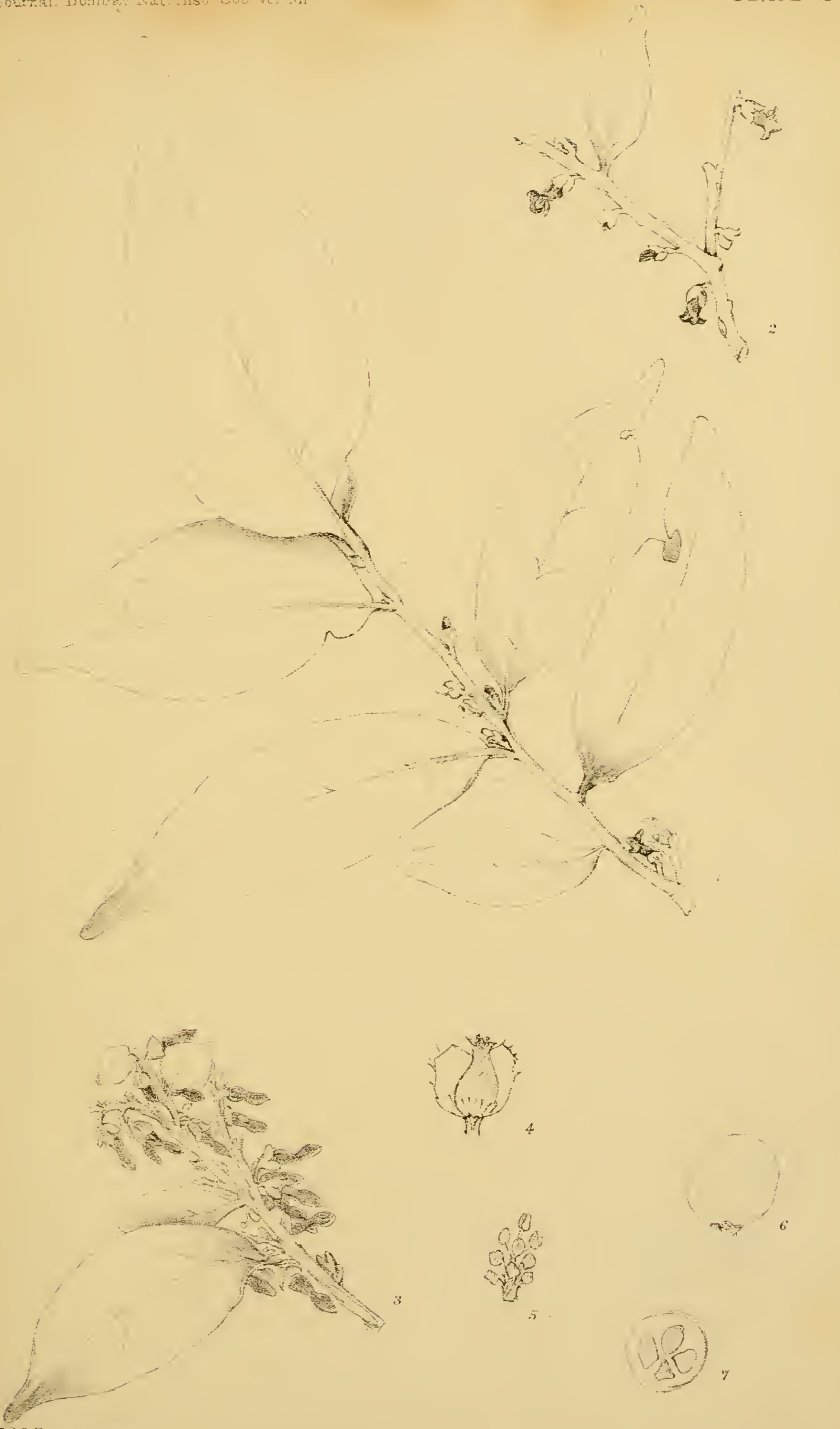
TERMINALIA ANGUSTIFOLIA, Roxburgh.



M.M. Bourdillon. delt. Lith: by Chitra Silpi Co.

CANTHIUM PERGRACILE, Bourdillon.



M. M. Bourdillon, delt.
Lith: by Chitra Silpi Co.

DIOSPYROS HUMILIS, Bourdillon.

$\frac{1}{12}$ inch. Branchlets and undersides of leaves downy. Flowers diœcious, small, numerous, sessile, white, turning black in drying, solitary or in fascicles. Male flowers $\frac{1}{3}$ inch, with a long tube to the corolla. Calyx and corolla 4-lobed. Stamens 16 to 20, of unequal length and connected at their bases. Female flowers $\frac{1}{4}$ inch long. Calyx cleft half way, downy, 4-lobed, not accrescent in fruit. Corolla 4-lobed, white, glabrous. Ovary 4-celled, with one ovule in each cell. Staminodes about 4. Stigmas 4, black. Fruit globose, succulent, green, smooth, about $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter, containing 3 to 4 seeds. Albumen equable (?).

A small tree of the evergreen forests at elevations about 2,000 feet, near Merchiston estate. Height 30 feet. Diameter 10 inches. Flowers in March and April. Fruit in June.

Bark $\frac{1}{4}$ inch thick, green and black-mottled. No heart. Wood hard, dull greyish-brown tinged with purple, with small patches of black near the centre, coarse and rough. Medullary rays extremely fine. Pores very small, arranged in radial lines. Annual rings none. Weight 54 lbs. per cubic foot. P.=579.

Description of Plate VI—

1. Flowering branch with flowers—female tree.
2. Part of female branch.
3. Part of male branch.
4. Ovary × 4.
5. Stamens × 4.
6. Fruit—natural size.
7. Section of fruit—natural size.

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THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Professor of Botany,

College of Science, Poona.

Part VI.

(*Continued from page 176 of this Volume.*)

CVII.—Bignoniaceæ.

2. *Millingtonia.*

M. hortensis, *L.-f.*, F.B.I.—IV-378. *Cowla Nim.* Planted widely. Oct.-Nov.

3. *Oroxylum.*

O. indicum, *Vent.*, F.B.I.—IV-378. *Tetu.* Peint Taluka. W. Ghats. May, July.

4. *Tecoma.*

T. stans, *Juss.*, *D. C.*, Prod.—IX-224. Planted widely.

T. undulata, *G. Don.*, F.B.I.—IV-378. *Rakta rohida. Lohero.* W. Kandeish. Bunass River. Gujerat. *Dalzell.* Mar.-Apl.

5. *Dolichandrone.*

D. falcata, *Seem.*, F.B.I.—IV-380. *Morshing, Mershing.* Poona. May.

D. Lawii, *Seem.*, F.B.I.—IV-380. *Medashingi.* Konkan. N. Kanara. Mar. May.

6. *Heterophragma.*

H. Roxburghii, *DC.*, F.B.I.—IV-381. *Warus, Varasa.* Poona. W. Ghats. Dec.

8. *Stereospermum.*

S. chelonoides, *DC.*, F.B.I.—IV-382. *Pâdal. Ginsingmara.* Khandalla. Bankot. Apl.-May.

S. sauveolens, *DC.*, F.B.I.—IV-382. *Parul, Patala, Kálgari.* Poona, planted Apl.

S. xylocarpum, *Wight*, F.B.I.—IV-383. *Kadashinga, Kursing.* Peint. Apl.

9. *Panjanelia.*

P. Rheedii, *DC.*, F.B.I.—IV-384. Yellapur Taluka. *Talbot.* Cold Season.

Parmentiera (Tropical America).

P. cerifera, *Candle tree of Panama.* W. I. Club Garden. Poona.

CVIII.—Pedalineæ.

1. *Pedalium.*

P. murex, *Linn.*, F.B.I.—IV-386. *Malvi gokharu.* Badami. Shrivardhan. Oct.

2. *Sesamum.*

S. indicum, *DC.*, F.B.I.—IV-387. *Teel.* Cult. Aug.-Sept.

S. laciniatum, *Klein.*, F.B.I.—IV-387. Badami. Oct.

CIX—Acanthaceæ.

1. *Thunbergia.*

T. fragrans, *Roxb.*, F.B.I.—IV-390. *Chimine.* Panchgani. Oct.

T. alata, *Bojer*, F.B.I.—IV-391. Cult.

T. Hawtayneana, *Wall.*, F.B.I.—IV-391. Dharwar.

T. grandiflora, *Roxb.*, F.B.I.—IV-392. Cult. Gardens.

T. mysorensis, *T. Anders.*, F.B.I.—IV-393. Planted Mahabl. Poona. Near Gairsoppa, *Talbot.* Nov.-Jan.

2. *Elytraria.*

E. crenata, *Vahl.*, F.B.I. -IV-394. *Dasmori.* Ahmedabad. Oct.

3. *Nelsonia.*

N. campestris, *Br.*, F.B.I.—IV-394. 23 miles East of Rutnagiri. Jan.

4. *Ebermaiera.*

E. glauca, *Nees.*, F.B.I.—IV-395. S. Konkan, *Dalzell.*

E. zeylanica, *Nees.*, F.B.I.—IV-397. Warree Jungles, *Dalzell.*

6. *Cardanthera.*

C. balsamica, *Benth.*, F.B.I.—IV-404. Siddapur, *A. P. Young.* Mar.

C. pinnatifida, *Benth.*, F.B.I.—IV-405. Divimana, N. Kanara. Feb.

7. *Hygrophila.*

H. polysperma, *T. Anders.*, F.B.I.—IV-406. Verawal. Rajkot.

H. serphyllum, *T. Anders.*, F.B.I.—IV-406. W. Ghats, widely. Sept.-Jan.

H. spinosa, *T. Anders.*, F.B.I.—IV-408. *Kolista Kolasundâ Talimkhana, Ekara.* Deccan, widely. June-Jan.

9. *Calophanes.*

C. Nagchana, *Nees.*, F.B.I.—IV-410. Dang. Nasik. Apr.

C. Dalzellii, *T. Anders.*, F.B.I.—IV-411. Dang. Poona. May.

10. *Ruellia.*

R. patula, *Jacq.*, F.B.I.—IV-412. *Katmora.* Deccan. June-Nov.

R. longifolia, *T. Anders*, F.B.I.—IV-412. Scind, *Stocks.*

12. *Petalidium.*

P. barlerioides, *Nees.*, F.B.I.—IV-416. Bansda, Dang. Feb.-April.

13. *Phaylopsis.*

P. parviflora, *Willd.*, F.B.I.—IV-417. *Akkinachori.* Badami. Jan.

14. *Dœdalacanthus.*

D. nervosus, *T. Anders.*, F.B.I.—IV.-419. 12 miles west of Poona. Dec.

D. roseus, *T. Anders.*, F.B.I.—IV-419. *Dasamuli.* Konkan. Nov.-Jan.

D. purpurescens, *T. Anders.*, F.B.I.—IV-420. Konkan. Nov.-Jan.

D. montanus, *T. Anders.*, F.B.I.—IV-421. Ghâts near Dharwar. *Dalzell.*

15. *Hemigraphis.*

H. dura, *T. Anders.*, F.B.I.—IV-422. *Gantelbu.* Surat. Gadak. Jan.

H. latebrosa, *Nees.*, F.B.I.—IV-422. Rewadanda. Marmagoa. Dec.

H. elegans, *Nees.*, F.B.I.—IV-424. Nasik. Jan.

18. *Strobilanthes.*

S. barbatus, *Nees.*, F.B.I.—IV-437. Castle Rock. Matheran. Oct.-Nov.

S. warreensis, *Dalz.*, F.B.I.—IV-439. Nilkund Ghat. Feb.

S. ciliatus, *Nees*, F.B.I.—IV-439. Sawantwadi. Nov.

S. lupulinus, *Nees.*, F.B.I.—IV-443. Ram Ghât, Belgaum, *Ritchie.*

S. Heyneanus, *Nees.*, F.B.I.—IV-443. Castle Rock. Matheran. Oct.-Nov.

S. ixiocephalus, *Benth.*, F.B.I.—IV-444. *Waiti.* Vingorla. M'war. Dec.-Jan.
S. scrobiculatus, *Dalz.*, F.B.I.—IV-445. Mahableshwar. Nov.
S. callosus, *Nees.*, F.B.I.—IV-451. *Karwi, Kara, Karowa.* Mahableshwar. Oct.
S. reticulatus, *Staph.*, *Kew Bull.*, 1894, fol. 347. Mahableshwar. Oct.
S. asper, *Wgt.*, F.B.I.—IV-452. Santaveri. Dec.
S. sessilis, *Nees.*, *var.* Sessiloides, *Wt.*, F.B.I.—IV-452. Ambooli. Jan.
S. perfoliatus, *T. Anders.*, F.B.I.—IV-458. Matheran, Kadgal, N. Kanara. Jan.-Feb.

19. *Calacanthus.*

C., Dalzelliana, *T. Anders.*, F.B.I.—IV-478. Matheran. Lonauli. Oct.-Jan.

20. *Blepharis.*

B. asperrima, *Nees.*, F.B.I.—IV-478. *Akada.* M'war. Rewadanda. Oct.
B. boerhaavifolia, *Pers.*, F.B.I.—IV-478. Surat. Ahmd. Rajkot. Oct.-Dec.
B. molluginifolia, *Pers.*, F.B.I.—IV-479. *Kanti Maka.* Badami. Karnalee. Guzerat. Sept.-Oct.
B. sindica, *Stocks.*, F.B.I.—IV-479. *Jasad.* Bulokhan, Sind. Aug.

21. *Acanthus.*

A. ilicifolius, *Linn.*, F.B.I.—IV-481. *Marandi.* Thana Creek. Karwar. Apl.-May.

22. *Barleria.*

B. Prionitis, *Linn.*, F.B.I.—IV-482. *Pivala Koranti. Kalsunda.* Matheran. Deccan, widely. Nov.
B. Hochstettari, *Nees.*, F.B.I.—IV-483. Sind.
B. acanthoides, *Vahl.*, F.B.I.—IV-484. Sind. Oct.
B. tomentosa, *Both.*, F.B.I.—IV-485. Badami. Nov.
B. involucrata, *Nees.*, F.B.I.—IV-485. Ambooli Ghat. Oct.
B. Lawii, *T. Anders.*, F.B.I.—IV-486. Shinvaghad. Oct.
B. sepalosa, *Clarke*, F.B.I.—IV-417. Konkan. *Gibson.*
B. montana, *Nees.*, F.B.I.—IV-487. W. Ghats, Oct.
B. Gibsoni, *Dalz.*, F.B.I.—IV-487.
B. grandiflora, *Dalz.*, F.B.I.—IV-488. W. Ghats. Oct.
B. cristata, *Linn* , F.B.I.—IV-488. *Gokran.* W. Ghats and Deccan Hills. Dec.
B. courtallica, *Nees.*, F.B.I.—IV-489. Arbail Ghats, N. Kanara. Feb.
B. Stocksii, *T. Anders.*, F.B.I.—IV-489. Bababudan Hills, *Stocks.*
B. strigosa, *Willd.*, F.B.I.—IV-489.
var. terminalis, F.B.I.—IV. *Kala Koranta, Wahii.* Vingorla. Marmagoa. Dec.
B. lupulina, *Ldl. D.C.*, Prod. XI-237. Gardens.

23. *Neuracanthus.*

N. trinervius, *Wt.*, F.B.I.—IV-491. Khandalla. Dec.-Jan.
N. spærostachys, *Dalz.*, F.B.I.—IV-491. Khandalla. Pen. Sept.-Oct.

24. *Crossandra.*

C. undulifolia, *Salisb.*, F.B.I.—IV-492. *Aboli.* Kumpta. June-Jan.

25. *Asystasia.*

A. coromandeliana, *Nees.*, F.B.I.—IV-493. W. Ghats. Nov.-Dec.
A. violacea, *Dalz.*, F.B.I.—IV-493. Matheran. Bassein. Nov.
A. Lawiana, *Dalz.*, F.B.I.—IV-496. Belgaum. Poona. Aug.-Oct.

26. *Eranthemum.*

E. malabaricum, Clarke, F.B.I.—IV-497. Marmagoa. Dec.
E. bicolor. Gardens.

28. *Andrographis.*

A. paniculata, *Nees.*, F.B.I.—IV-501. *Oleikaryet.* Honawar. Dec.
A. Neesiana, *Wgt.*, F.B.I.—IV-504.
A. echioides, *Nees.*, F.B.I.—IV-505. *Guz.* Karnala, Badami. Sept.-Nov.

29. *Haplanthus.*

H. verticillaris, *Nees.*, F.B.I.—IV-506. *Kateri.*: Mahableshwar. Sinvaghad. Dec.
H. tentaculatus, *Nees.*, F.B.I.—IV-507. Surat. Marmagoa. Dec.

30. *Gymnostachyum.*

G. glabrum, *T. Anders.*, F.B.I.—IV-509. Castle Rock. Jan.
G. canescens, *T. Anders.*, F.B.I.—IV-509. Kanara Ghats, *Law.*
G. latifolium, *T. Anders.*, F.B.I.—IV-509. Castle Rock. Dec.

31. *Phlogacanthus.*

P. curviflorus, *Nees.*, F.B.I.—IV-511. Cult. Gardens.

34. *Lepidagathis.*

L. cristata, *Willd.*, F.B.I.—IV-516. *Bui Gend.* Deccan. Oct.-March.
L. mitis, *Dalz.*, F.B.I.—IV-516. Belgaum, *Dalzell.*
L. trinervius, *Nees.*, F.B.I.—IV-517. Pahlanpur. Perim, Kathiawad. Nov.-Feb.

L. lutea, *Dalz.*, F.B.I.—IV-517. Jaighur. Dec.
L. clavata, *Dalz.*, F.B.I.—IV-518.
L. prostrata, *Dalz.*, F.B.I.—IV-518. Marmagoa. Dec.
L. rigida, *Dalz.*, F.B.I.—IV-518. Scind, *T. Anderson.*
L. cuspidata, *Nees.*, F.B.I.—IV-519. *Akhara.* W. Ghats. Dec.-Mar.
L. calycina, *Hochst.*, F.B.I.—IV-519. Sind, *Stocks.*
L. scariosa, *Nees.*, F.B.I.—IV-520.
L. hyalina, *Nees.*, F.B.I.—IV-521. N. Kanara. May.
L. fasciculata, *Nees.*, F.B.I.—IV-522.

38. *Justicia.*

J. montana, *Wall.*, F.B.I.—IV-525. Yacombi, N. Kanara. Feb.
J. Betonica, *Linn.*, F.B.I.—IV-525.
var. ramosissima. Sangameshwar. Dec.
J. trinervia, *Vahl.*, F.B.I.—IV-525. Mahableshwar.
J. glauca, *Roth.*, F.B.I.—IV-529. Badami. Aug.-Oct.
J. heterocarpa, *T. Anders.*, F.B.I.—IV-531. Porebunder. Nov.
J. Gendarussa, *Linn.*, F.B.I.—IV-532. *Tew.* Cult. Nov.-Jan.
J. wynadensis, *Wall.*, F.B.I.—IV-533. Marmagoa. Dec.

J. micrantha, *Wall.*, F.B.I.—IV-536. Vingorla, *Dalzell.* Aug.
J. quinquangularis, *Koen.*, F.B.I.—IV-536. Badami.
J. quinquangularis, *var.* peploides. Poona. Oct.-Apr.
J. diffusa, *Willd.*, F.B.I.—IV-538. Poona. Oct.-Dec.
J. simplex, *Don.*, F.B.I.—IV-539. Pahlanpore. Rajkote. Dec.
J. simplex, *var.* serpyllifolia, *Benth.* Badami, N. Kanara. Nov.-Dec.
J. procumbens, *Linn.* *Karambal Kalmashi.* Deccan. Oct.-Mar.

39. *Adhatoda.*

A. vasica, *Nees.*, F.B.I.—IV-540. *Adulsa, Karav.* Guzerat to N. Kanara. Aug.

40. *Rhinacanthus.*

R. communis, *Nees.*, F.B.I.—IV-541. *Gajakarni.* M'war. Gardens. Oct.-Jan.

Dianthera. (*West Indies*).

D. secunda (*Rhytiglossa*), *DC.*, Prod.—XI-340. Bot. Mag. 2060. Gardens. Oct.-Nov.

Jacobinia (*Central America*).

J. (Drejera) boliviensis, *DC.*, Prod.—XI-334. Gardens.

44. *Ecbolium.*

E. Linneanum, *Kurz.*, F.B.I.—IV-544. *Ranaboli. Dahktvadulsa.* Matheran. Nov.-Dec.
E. Linneanum *var.* dentata. Karanja. Sept.

45. *Graptophyllum.*

G. hortense, *Nees.*, F.B.I.—IV-545. Gardens.

46. *Rungia.*

R. crenata, *T. Anders.*, F.B.I.—IV-547. Kanara. *Law.* Konkan, *Stocks.* Belgaum, *Ritchie.*
R. linifolia, *Nees.*, F.B.I.—IV-548. Banks of Kala Nadi.
R. repens, *Nees.*, F.B.I.—IV-549. Dandali, N. Kanara. Jan.
R. elegans, *Dalz.*, F.B.I.—IV-549. Dharwar. Poona. Sept.
R. parviflora, *Nees.*, F.B.I.—IV-550. *Kalinachi, Turmura.* W. Ghats. Jan.-Feb.
R. parviflora, *var.* pectinata. *Turbura.* Panvel. Marmagoa. Dec.-Feb.

47. *Dicliptera.*

D. zeylanica, *Nees.*, F.B.I.—IV-552. W. Ghats. Dec.-Jan.
D. cuneata, *Nees.*, F.B.I.—IV-552. Mawal. Jaronda Hill. Jan.
D. micranthes, *Nees.*, F.B.I.—IV-553. *Amaphutavani.* Sahkpur, Sind. Oct.

48. *Peristrophe.*

P. bicalyculata, *Nees.*, F.I.B.—IV-554. Poona. Surat. Sind. Nov.

49. *Hypoestes.*

H. lanata, *Dalz.*, F.B.I.,—IV-557. Konkan.

CXI.—VERBENACEÆ.

2. *Lantana.*

L. indica, *Roxb.*, F.B.I.—IV-562. Jamnager. Jooner. Sep.-Jan.
L. camara, *Linn.*, F.B.I.—IV-562. *Tantani.* Spread widely. All the Year.

3. *Lippia.*

L. nodiflora, *Rich.*, F.B.I.—IV-563. *Bookan* (Sind). Deccan. Guzerat. Sind. All the Year.

4. *Bouchea.*

B. marrubifolia, *Schauer*, F.B.I.—IV-564. Sind.

5. *Stachytarpheta.*

S. indica, *Vahl.*, F.B.I.—IV-564. Weed in Gardens. Aug.-Nov.
S. mutabilis, *Vahl.*, *DC.*, Prod.—XI-565. Gardens. Aug.-Nov.

6. *Priva.*

P. leptostachya, *Juss.*, F.B.I.—IV-565. Bijapur. Sind. Dec.-Jan.

7. *Verbena.*

V. venosa, *Gill.*, *DC.*, Prod.—XI-541. Planted. Sinvaghad.
V. officinalis, *Linn.*, F.B.I.—IV-565. A weed in gardens. Sept.

Citharexylum.

C. subserratum, *Swartz.*, *DC.*, Prod.—XI-614. Gardens. Nov.-Dec.

Duranta.

D. Plumieri, *Jacq.*, *DC.*, Prod.—XI-615. Planted. June-Dec.

9. *Callicarpa.*

C. lanata, *Linn.*, F.B.I.—IV-567. *Aisur.* Khandalla. Castle Rock. Nov.-Feb.

10. *Tectona.*

T. grandis, *L. f.*, F.B.I.—IV-578. *Sagu. Saguvan.* Deccan Hills and Konkan. Aug.

11. *Premna.*

P. scandens, *Roxb.*, F.B.I.—IV-573. *Guradwel.* Matheran. Oct.
P. coriacea, *Clarke*, F.B.I.—IV-573. Khandalla.
P. integrifolia, *Linn.*, F.B.I.—IV-574.
P. latifolia, *Roxb.*, F.B.I.—IV-577.

12. *Gmelina.*

G. arborea, *Linn.*, F.B.I.—IV-587. *Sievan, Bothee.* Dang. Mawal. Feb.-Mar.
G. asiatica, *Linn.*, F.B.I.—IV-582. *Lahan Shivan.* Poona.
G. Hyxtrix, *Kurz.*, F.B.I.—IV-582. Gardens.

13. *Vitex.*

V. negundo, *Linn.*, F.B.I.—IV-583. *Nirguri, Nagoda.* W. Ghats. Konkan. Jan.
V. altissima, *Linn*, F.B.I.—IV-584. *Banalgay.* Yacumbi, N. Kanara. July-Feb.
V. alata, *Heyne*, F.B.I.—IV-584. Limbagaon. Sattara. May.
V. leucoxylon, *Linn.*, F.B.I.—IV-587. Atgaon, Thana. Limbagaon. Mar.

14. *Clerodendron.*

C. inerme, *Gaertn.*, F.B.I.—IV-589. *Koiwale, Wanjai, Nurwale.* Konkan. Guzerat. Nov.-Jan.

C. phlomoides, *Linn.*, F.B.I.—IV-590. *Airan, Takle.* Surat. Broach. Thana. Aug.-Feb.

C. calamitosum, *Linn.*, F.B.I.—IV-591. Gardens. Bombay. Sep.-Oct.
C. nutans, *Wall.*, F.B.I.—IV-591. Gardens. Aug.-Sept.
C. serratum, *Spr.*, F.B.I.—IV-592. *Bhârangï.* W. Ghats. Purandhur. Aug.
C. infortunatum, *Gaertn.*, F.B.I.—IV-594. *Kûri, Bhandira.* W. Ghats. Aug.-Sept.
C. Buchanani, *Roxb.*, F.B.I.—IV-596. Gardens. June-Dec.
C. Siphonanthus, *Br.*, F.B.I.—IV-595. Gardens. Sept.-Oct.
C. aculeatum, *Linn.*, *DC.*, Prod.—XI-656. Gardens. Oct.
C. emirense, *Bojer.*, *DC.*, Prod.—XI-661. Gardens. Sept.-Oct.
C. fragrans, *Vent.*, *DC.*, Prod.—XI-666. Gardens. Sept.-Nov.
C. Thomsonæ, Bot. Mag., 5313. Gardens. Sept.-Dec.

15. *Holmskioldia.*

H. sanguinea, *Retz.*, F.B.I.—IV-596. Gardens. Sept.

20. *Symphorema.*

S. involucratum, *Roxb.*, F.B.I.—IV-599. Washind, Thana. Mar.
S. polyandrum, *Wight*, F.B.I.—IV-599. Belgaum.

22. *Congea.*

C. tomentosa, *var.* azurea, *Roxb.*, F.B.I.—IV-604. Gardens.

23. *Avicennia.*

A. officinalis, *Linn.*, F.B.I.—IV-604. *Tivar.* Bombay, Seashore. May-June.

CXII.—LABIATEÆ.

1. *Ocimum.*

O. canum, *Sims.*, F.B.I.—IV-607. *Rantulasa.* Deccan, widely. July-Nov.
O. Basilicum, *Linn.*, F.B.I.—IV-608. *Sabja Kama-Kasturi.* Cultivated.
O. gratissimum, *Linn.*, F.B.I.—IV-608. *Malitulas, Ramtulas.*
O. adscendens, *Willd.*, F.B.I.—IV-608. Common, *Dalzell.*
O. sanctum, *Linn.*, F.B.I.—IV-608. Cultivated.

2. *Geniosporum.*

G. prostratum, *Benth.*, F.B.I.—IV-610. S. Konkan, *Nimmo.*

4. *Platysoma.*

P. flaccidum, *Benth.*, F.B.I.—IV-611. Konkan on the Kala Nudi, *Dalzell.*

5. *Acrocephalus.*

A. capitatus, *Benth.*, F.B.I.—IV-611. Poladpur, Vingorla. Oct.

6. *Moschosma.*

M. polystachyum, *Benth.*, F.B.I.—IV-612. Nadiad, Ahmedabad. Nov.

7. *Orthosiphon.*

O. pallidus, *Boyle*, F.B.I.—IV-613. Deccan, widely.
O. tomentosum, *Benth.*, F.B.I.—IV-613.
O. tomentosum, *var.* glabratum Narel, Pali. July.

8. *Plectranthus.*

P. Stocksii, *Hook. f.*, F.B.I.—IV-618. Konkan, *Stocks.*
P. Wightii, *Benth.*, F.B.I.—IV-619. Mahableshwar, Londa. Oct.
P. menthoides, *Benth.*, F.B.I.—IV-620. Panchgani, Singhur. Dec.

P. incanus, *Link.*, F.B.I.—IV-621. *Lal-agadha.* Poona, Khandalla. Sept.
P. subincisus, *Benth.*, F.B.I.—IV-621. Poona. Sept.

9. *Coleus.*

C. spicatus, *Benth.*, F.B.I.—IV-624. Gokak Coast, North of Bassein. Feb.
C. barbatus, *Benth.*, F.B.I.—IV-625. *Máin-mool, Garmal,* Mawal. Guzerat. Sept.
C. aromaticus, *Benth.*, F.B.I.—IV-625. *Pathúr-chúr, Owa.* Cult. Gardens.
C. Blumei. *Garden Coleus.* Gardens. Dec.-Feb.

10. *Anisochilus.*

A. carnosus, *Wall.*, F.B.I.—IV-627. *Kapurli, Pan-jiray.* Mawal. Sept.
A. eriocephalus, *Benth.*, F.B.I.—IV-627. Konkan Ghats, Sward, *Dalzell.*
A. adenanthus, *Dalz. & Gibs.*, F.B.I.—IV-630. Panchgani. Oct.

10.^{a} *Hyptis.*

H. sauveolens, *Poit.*, F.B.I.—IV-630. Marmagoa.

11. *Lavandula.*

L. Gibsoni, *Grah.*, F.B.I.—IV-631. *Niwali.* Sinvagad. Jan.-May.
L. Burmanni, *Benth.*, F.B.I.—IV-631. *Gorëa.* Deccan, widely.

12. *Pogostemon.*

P. paniculatus, *Benth.*, F.B.I.—IV-631. Halyal. N. Kanara. Dec.
P. plectranthoides, *Desf.*, F.B.I.—IV-632. Poona. Jan.-Feb.
P. purpurascens, *Dalz.*, F.B.I.—IV-632. *Pangala.* W. Ghats.
P. parviflorus, *Benth.*, F.B.I.—IV-632. *Pangala.* Sulgeri, N. Kanara. Dec.-Jan.
P. Patchouli, *Pell.*, F.B.I.—IV-633. *Pach.* Gardens.

13. *Dysophylla.*

D. mysuroides, *Benth.*, F.B.I.—IV-638. Mahableshwar. Jan.
D. salicifolia, *Dalz.*, F.B.I.—IV-638. Mahableshwar Hills, *Gibson.*
D. auricularia, *Bl.*, F.B.I.—IV-638. Belgaum, *Ritchie.*
D. quadrifolia, *Benth.*, F.B.I.—IV-639. Malwan., *Dalzell.*
D. stellata, *Benth.*, F.B.I.—IV-640. Belgaum, *Law.*
D. tomentosa, *Dalz.*, F.B.I.—IV-641. Malwan, *Dalzell.*
D. gracilis, *Dalz.*, F.B.I.—IV-641. Phonda Ghat, *Ritchie.*
D. erecta, *Dalz.*, F.B.I.—IV-641. Malwan, *Dalzell.*
D. Stocksii, *Hook. f.*, F.B.I.—IV-641. Konkan, *Stocks.*

14. *Colebrookia.*

C. oppositifolia, *Sm.*, F.B.I.—IV-642. *Bahmini.* W. Ghats, widely. Jan.-May.

18. *Mentha.*

M. viridis, *L.*, *DC.*, Prod.—XII-168. *Spearmint.* Gardens.
M. piperita, *L.*, *DC.*, Prod.—XII-169. *Peppermint.* Gardens.
M. arvensis, *Linn.*, F.B.I.—IV-648. *Pudina.*

20. *Origanum.*

O. vulgare, *Linn.*, F.B.I.—IV-648. *Murwa, Marjoram.* Cultivated.

21. *Thymus.*

T. Serpyllum, *Linn.*, F.B.I.—IV-648. *Thyme.* Gardens.

23. *Micromeria.*

M. capitellata, *Benth.*, F.B.I.—IV-649. Mahableshwar. May.

27. *Meriandra.*

M. bengalensis, *Benth.*, F.B.I.—IV-653. *Kafurkapatta.* Gardens.

28. *Salvia.*

S. lanata, *Roxb.*, F.B.I.—IV-654. Gardens.

S. plebeia, *Br.*, F.B.I.—IV-655. *Thorla Aginthamba. Kinro.* Sept.-Feb.

S. ægyptiaca, *Linn.*, F.B.I.—IV-656. *Tukm.* Malanga.

S. ægyptiaca, *var.* pumile. *Tukhm Malanga.* Jooneer. Karachi. Rajkot. Nov. Dec.

S. coccinea, *Linn.*, *DC.*, Prod.—XII-343. Gardens.

S. involucrata, *Cav.*, *DC.*, Prod.—XII-333.

S. farinacea, *Benth.*, *DC.*, Prod.—XII-302. Gardens.

29. *Nepeta.*.

N. ruderalis, *Ham.*, F.B.I.—IV-661. Konkan.

N. bombaiensis, *Dalz.*, F.B.I.—IV-661. Sinvagad. Aug.-Sept.

32. *Scutellaria.*

S. discolor, *Coleb.*, F.B.I.—IV-667. Castle Rock. Oct.

36. *Anisomeles.*

A. Heyneana, *Benth.*, F.B.I.—IV-672. *Sambarboradu.* Badami. Deccan. Konkan. Jan.

A. ovata, *Br.*, F.B.I.—IV-672. *Gopali.* Sinvagad. Aug.

A. malabarica, *Br.*, F.B.I.—IV-673. *Mugbir.* Katriz Ghat. Oct.-Nov.

41. *Leonurus.*

L. sibiricus, *Linn.*, F.B.I.—IV-678. Santaveri. Bombay. Sept.

45. *Leucas.*

L. urticæfolia, *Br.*, F.B.I.—IV-680. *Koomba.* Ahmedabad. Deccan, widely. Nov.

L. montana, *Spr.*, F.B.I.—IV-682. Purandhur. Bhor. Dec.-May.

L. mollisima, *Wall.*, F.B.I.—IV-682. Sinvaghad. Juggal Peit. N. Kanara. Nov.

L. procumbens, *Desf.*, F.B.I.—IV-683. Kanara, *Ritchie.*

L. biflora, *Br.*, F.B.I.—IV-683. *Bala.* Guzerat. Deccan, widely. Nov.

L. longifolia, *Benth.*, F.B.I.—IV-684. *Shetwad, Dudani Goma.* Deccan, widely. July-Jan.

L. stelligera, *Wall.*, F.B.I.—IV-686. *Burumbi.* Mahableshwar. Jan.

L. vestita, *Benth.*, F.B.I.—IV-686. Badami. Aug.

L. ciliata, *Benth.*, F.B.I —IV-687. Mahableshwar. Jan.-Mar.

L. stricta, *Benth.*, F.B.I.—IV-688. Karlimati, Dharwar. Aug.

L. nutans, *Spr.*, F.B.I.—IV-688. Karlimati. Aug.

L. martinicensis, *Br.*, F.B.I.—IV-688. Karli, Poona. Oct.-Feb.

L. Cephalotes, *Spr.*, F.B.I.—IV-689. *Tumba.* Chandod. Guzerat. Nov.

L. diffusa, *Benth.*, F.B.I.—IV-689. *Borang.* Badami. Oct.

L. aspera, *Spr.*, F.B.I.—IV-690. *Thurdari baji*, *Tamba.* Deccan. Oct.

46. *Leonotis.*

L. nepetæfolia, *Br.*, F.B.I.—IV-691. *Dipmal, Matisul.* Deccan, Konkan, widely. Sept.-Oct.

CXIII.—Plantagineæ.

1. *Plantago.*

P. major, *Linn.*, F.B.I.—IV-705. *Bártang.* Poona. Sept.-Feb.
P. Stocksii, *Boiss.*, F.B.I.—IV-706. Khirtar Mountains, *J. E. M. James.* Mar.
P. amplexicaulis, *Cav.*, F.B.I.—IV-706. Gajpipali. Boogta Hills, Sind, *Vicary.*
P. ovata, *Forsk.*, F.B.I.—IV-707. *Isabghol.* Sind, *Stocks.*
P. ciliata, *Desf.*, F.B.I.—IV-707. Khirtar Mts., *J. E. M. James.* Mar.

CXXVIII.—Nyctagineæ.

2. *Boerhaavia.*

B. repens, *Linn.*, F.B.I.—IV-709. *Vasu, Ghetuli.* Deccan. Guzerat. Sind. Nov.
B. repanda, *Willd.*, F.B.I.—IV-709. *Pungali.* Deccan. Oct.-Nov.
B. verticillata, *Poir.*, F.B.I.—IV-710. *Sátura.* Deccan, Konkan, Kathywar. Aug.-Dec.
B. fruticosa, *Dalz.*, F.B.I.—IV-710. Joonneer Fort, *Dalzell.*
B. elegans, *Chois.*, F.B.I.—IV-710. Sind, *Stocks.*

3. *Pisonia.*

P. alba, *Span.*, F.B.I.—IV-711. *Chinai Salit.* Gardens.

Mirabilis.

M. jalapa, *L.*, *DC.*, Prod.—XIII-426. *Gulbas, Guldbash.* Gardens. Aug.-Dec.

CXXIX.—Illecebraceæ.

2. *Cometes.*

C. surattensis, *Burm.*, F.B.I.—IV-712. Sind. Jan.

CXXX.—Amarantaceæ.

2. *Celosia.*

C. argentea, *Linn.*, F.B.I.—IV-714. *Kurdu.* Very widely. Oct.-Dec.
C. cristata, *Linn.*, F.B.I.—IV-715. *Cockscomb.* Cult. and as an escape. Oct.-Dec.
C. pulchella, *Mog.*, F.B.I.—IV-715. Santaveri, *Talbot.* Dec.
C. polygonoides, *Retz.*, F.B.I.—IV-715. Badami. Nov.

5. *Allmania.*

A. nodiflora, *Br.*, F.B.I.—IV-717. Purandhar. Badami. Nov.

6. *Digera.*

D. arvensis, *Forsk.*, F.B.I.—IV-717. *Lulir, Kanjaro.* Deccan, Guzerat, Sind. Oct.-Nov.

7. *Amarantus.*

A. spinosus, *Linn.*, F.B.I.—IV-718. *Katemâtha.* Widely. Sept.
A. paniculatus, *Linn.*, F.B.I—IV-718. *Râjagirâ.* Cult.
A. caudatus, *Linn.*, F.B.I.—IV-719. *Love lies bleeding.* Cult.
A. gangeticus, *Linn.*, F.B.I.—IV-719. *Math.* Cult.

A. mangostanus, *Linn.*, F.B.I.—IV-720. *Pokala.* Gardens. Cult.
A. viridis, *Linn.*, F.B.I.—IV-720.
A. Blitum, *Linn.*, F.B.I.—IV-721. *Tandulza.*
A. polygamus, *Linn.*, F.B.I.—IV-721. *Tandulza, Chauli.* Poona. Dec.-Mar.
A. tenuifolius, *Willd.*, F.B.I.—IV-722. *Tandulza, Chowlia.*

9. *Pupalia.*

P. atropurpurea, *Moq.*, F.B.I.—IV-723. Gardens.
P. orbiculata, *Wight.*, F.B.I.—IV-724. Sind.
P. lappacea, *Moq.*, F.B.I.—IV-724. *Daliya, Antriki.* Badami. Champaner. Sept.-Jan.

11. *Psilostachys.*

P. sericea, *Hook. f.*, F.B.I.—IV-726. Perim. Katiawad. Jan.

12. *Nothosærua.*

N. brachiata, *Wight*, F.B.I.—IV-726. Surat. Nov.

13. *Ærua.*

Æ. javanica, *Juss.*, F.B.I.—IV-727. *Buh-wado* (Sind). Shikarpur, Sind. Deccan. Dec.
Æ. scandens, *Wall.*, F.B.I.—IV-727. Marmagoa. Sinvagad. Dec.
Æ. lanata, *Juss.*, F.B.I.—IV-728. *Kapuri-Maduri.* Deccan. Aug.-Sept.
Æ. Monsonia, *Mart.*, F.B.I.—IV-728. Badami. Oct.-Dec.

15. *Achyranthes.*

A. aspera, *Linn.*, F.B.I.—IV-730. *Ubat Khandi, Agada.* Deccan. Sind.
A. bidentata, *Blume*, F.B.I.—IV-730. Not yet found.

16. *Alternanthera.*

A. sessilis, *Br.*, F.B.I.—IV-731. *Kanchri, Jaljamba.* Deccan. Konkan. July-Dec.

17. *Gomphrena.*

G. globosa, *Linn.*, F.B.I.—IV-732. Cult. Aug.-Mar.

CXVII.—CHENOPODIACEÆ.

2. *Chenopodium.*

C. album, *Linn.*, F.B.I.—V-3. *Chakravat.* Poona, widely. Nov.
C. murale, *Linn.*, F.B.I.—V-4. Dharwar. Poona. Aug.
C. ambrosioides, *Linn.*, F.B.I.—V-4. *Sherui.* Poona. Aug.-Apr.

3. *Beta.*

B. vulgaris, *Linn.*, F.B.I.—V-5. *Beet.* Cult.

4. *Spinacia.*

S. oleracea, *Linn.*, F.B.I.—IV-6. *Pálak.* Cult.

5. *Atriplex.*

A. hortensis, *Linn.*, F.B.I.—V-6. *Karake, Suraka, Orache.* Cult.
A. Stocksii, *Boiss.*, F.B.I.—V-7. Sind. Verawal. Jan.

11. *Kochia.*

K. scoparia, *Schrad.*, F.B.I.—V-11. Sibi. Sept.
K. indica, *Wight.*, F.B.I.—V-11. Sibi. Sept.

12. *Anthrocnemum.*

A. indicum, *Mog.*, F.B.I.—V-12. *Machur, Machola. Chil.* Karachi. Dec.

A. glaucum, *Mog.*, F.B.I.—V-12. *Machola, Chil.* Karachi. Dec.

13. *Salicornia.*

S. brachiata, *Roxb.*, F.B.I.—V-12. *Machul.* Nowsaree. Porebandar. Nov.-Dec.

14. *Suæda.*

S. fruticosa, *Forsk.*, F.B.I.—V-13. *Morasa, Ushuk-lani.* Dwarka. Bhownuggar. Nov.-Dec.

S. monoica, *Forsk.*, F.B.I.—V-13. Kurrachee. Dharampter. Nov.-Dec.

S. mudiflora, *Mog.*, F.B.I.—V-14. *Morasa.*

S. maritima, *Dumort*, F.B.I.—V-14. *Khari-lani, Lana.* Sind. May.

15. *Haloxylon.*

H. recurvum, *Bunge.*, F.B.I.—V-15. *Khari-lani.* Sukkur. Nov.

H. salicornicum, *Bunge.*, F.B.I.—V-16. Sibi. Oct.

16. *Salsola.*

S. fœtida, *Del.*, F.B.I.—V-18. *Lanan, Ellakura.*

18. *Halocharis.*

H. sulphurea, *Mog.*, F.B.I.—V-19. Sibi, Sind. Sept.

20. *Basella.*

B. rubra, *Linn.*, F.B.I.—V-20. *Tambadi-velbondi, Myal-ke-baji.* Gardens. Oct.-Dec.

B. rubra, *var.* alba. *Velbondi, Myal-ke-baji.* Gardens. Oct.-Dec.

CXVIII.—PHYTOLACCEÆ.

1. *Rivina.*

R. lævis, *Linn.*, *DC.*, Prod.—XIII-10. Gardens. Aug.-Dec.

CXIX.—POLYGONACEÆ.

1. *Calligonum.*

C. polygonoides, *Linn.*, F.B.I.—V-22. Sind, *Stocks.*

2. *Pteropyrum.*

P. Oliveri, *Jaub.* and *Spach.*, F.B.I.—V-23. Laki, Sind. Oct.

3. *Polygonum.*

P. plebejum, *Br.*, F.B.I.—V-27. Deccan, Sind. Dec.-Mar.

P. tomentosum, *Willd.*, F.B.I.—V. 30. Kumpta. Samusgi. Dec.-May.

P. limbatum, *Meissn.*, F.B.I.—V-30. Konkan, *Law.*

P. glabrum, *Willd* F B.I.—V-34. *Dongar-rheta, Parala.* Deccan, widely. Oct.-Mar.

P. lapathifolium, *Linn.*, F.B.I.—V-35. Konkan.

P. barbatum, *Linn.*, F.B.I.—V-37. Alur. Dharwar Coll. Mar.

P. Hydropiper, *Linn.*, F.B.I.—V-39.

P. flaccidum, *Meissn.*, F.B.I.—V-39.

P. alatum, *Ham.*, F.B.I.—V-41. Mahableshwar. Aug.-Oct.

P. chinense, *Linn.*, F.B.I.—V-44.
P. pedunculare, *Wall.*, F.B.I.—V-48.
P. pedunculare, *var.* angustissima. Rutnagiri. Missar. Oct.

4. *Fagopyrum.*

F. esculentum, *Moench.*, F.B.I.—V-55. *Buckwheat.* Gardens. Jan.

7. *Rumex.*

R. dentatus, *Linn.*, F.B.I.—V-59. Sind. Konkan. *Lan.*
R. nepalensis, *Spr.* F.B.I.—V-60. Poona. Gardens. Sept.-Oct.
R. vesicarius, *Linn.*, F.B.I.—V-61. *Chuka.* Cult.

CXX.—PEDOSTEMONACEÆ.

1. *Terniola.*

T. pulchella, *Tal.*, F.B.I.—V-62. *Karak-ful.* W. Ghats. Oct.
T. Lawii, *Wedd.*, F.B.I.—V-63. W. Ghats. Oct.
T. longipes, *Tul.*, F.B.I.—V-63. W. Ghats, *Dalz.*
T. pedunculosa., F.B.I.—V-63. W. Ghats, *Dalz.*
T. foliosa, *Wedd.*, F.B.I.—V-63. W. Ghats, *Dalz.*

2. *Podostemon.*

P. dicotomus, *Gerdn.*, F.B.I.—V-64.
P. Hookerianus, *Wedd.*, F.B.I.—V-65. *Karak-ful.* Mawal. Oct.

CXXIII.—ARISTOLOCHIACEÆ.

2. *Bragantia.*

B. Wallichii, *Br.*, F.B.I.—V-73. Nalkund Ghat. Nov.
B. Dalzellii, *H. f.*, F.B.I.—V-73. Konkan, *Dalzell.*

4. *Aristolochia.*

A. bracteata, *Retz.*, F.B.I.—V-75. *Kalipat, Kidamar, Ghandata.*
A. indica, *Linn.*, F.B.I.—V-75. *Sapsanda.*
A. fimbriata, *Cham.*, *DC.*, *Prod.*—XV—S. I. 454. Gardens. Cult.
A. ornithocephala, *Hort.* Gardens. Cult.
A. elegans. Bot. Mag. 6909. Gardens. Cult.

CXXXIX.—PIPERACEÆ.

1. *Piper.*

P. trichostachyon, *Cas.*, F.B.I.—V-80. Konkan. Kanara. Khandala.
P. longum, *Linn.*, F.B.I.—V-83. *Pipli.* Gardens. Oct.-Nov.
P. Betle, *Linn.*, F.B.I.—V-85. *Nagwail, Betle-vine.*
P. nigrum, *Linn.*, F.B.I.—V-90. *Merewail.* Gardens. Oct.
P. Hookeri, *Miq.*, F.B.I.—V-88.

3. *Peperomia.*

P. Wightiana, *Miq.*, F.B.I.—V-98. Konkan on trees, *Stocks.*
P. portulacoides, *A. Dietr.*, F.B.I.—V-90. Mahableshwar. Aug.
P. pellucida, *H. B. & K.* Bombay, common. Oct.

CXXVI.—MYRISTICEÆ.

1. *Myristica.*

M. laurifolia, *H.f. & T.*, F.B.I.—V-103. *Jayaphal, Jajikai.* Chandawar. N. Kanara. Feb.

M. malabarica, *Lamk.*, F.B.I.—V-103. *Ranjaiphal, Kaiphal.* Chandawar. N. Kanara.

M attenuata, *Wall.*, F.B.I.—V-110. *Rukt-mara.* Divimana Ghat. Feb.

CXXVIII.—LAURINEÆ.

1. *Cryptocarya.*

C. Wightiana, *Thw.*, F.B.I.—V-120. *Gulmur.* Matheran. Apl.-May.

3. *Beilschmiedia.*

B. fagifolia, *Nees.*, F.B.I.—V-122. Matheran. Ainshi Ghat. Dec.

B. Wightii, *Benth.*, F.B.I.—V-124. Matheran. Sept.

7. *Cinnamomum.*

C. zeylanicum, *Breyn.*, F.B.I.—V-131. *Dalchini, Ohez, Bojevar.* Lanauli. Londa. Nov.-Mar.

C. macrocarpum, *Hook.*, F.B.I.—V-133. Supa, N. Kanara. Jan.

8. *Machilus.*

M. macrantha, *Nees*, F.B.I.—V-140. *Gulum.* Lanauli. Kumtha. Dec.-Mar.

10. *Alseodaphne.*

A. semicarpifolia, *Nees*, F.B.I.—V-144. *Phudgus.* Yacombi, N. Kanara. Dec.

11. *Actinodaphne.*

A. Hookeri, *Meissn.*, F.B.I—V-149. *Pisha.* Mahableshwar.

11A. *Litsœa.*

L. tomentosa, *Herb.*, F.B.I.—V-157. *Chikna.* Castle Rock. Nov.

L. sebifera, *Pers.*, F.B.I.—V-157. *Maidalakdi.* Yacombi. Feb.-May.

L. Stocksii, *Hook.,f.*, F.B.I.—V-176. Mahableshwar. Oct.

L. Wightiana, *Wall.*, F.B.I.—V-177. Ghats, W. India, *DeCrespigny.* Near Gairsoppa, *Talbot.* Oct.-Nov.

L. zeylanica, *C. & Fr.*, F.B.I.—V-178. *Kanvel, Chirchira.* Mahableshwar. N. Kanara. Nov.

14. *Cassytha.*

C. filiformis, *Linn.*, F.B.I.—V-188. *Amarwela, Kotan.* Konkan. Sept.

CXXIX.—PROTEACEÆ.

Macadamia (*Eastern Australia*).

M. ternifolia, Gard. Chron., 1870—1181. Planted.

Grevillea (*Australia*).

G. robusta, *A. Cunn., DC., Prod.* *Silver Oak.* Planted.

CXXX.—THYMETÆACEÆ.

7. *Lasiosiphon.*

L. eriocephalus, *Dcne.*, F.B.I.—V-197. *Rametha.* Mahableshwar. Dec.-May.

CXXXI.—Eltæagnaceæ.

1. *Eltœagnus.*

E. latifolia, *Linn.*, F.B.I.—V-202. *Ambagula.* Mahableshwar.

CXXXII.—Loranthaceæ.

1. *Loranthus.*

The names *Bhangul, Vanda, Vundo,* are generally applied in this genus and to other parasites and epiphytes.

L. Wallichianus, *Schultz*, F.B.I.—V-204. Karwar. Aug.
L. obtusatus, *Wall.*, F.B.I.—V-205. Mahableshwar. April.
L. scurrula, *Linn.*, F.B.I.—V-208. Panchgani. Wada. Oct.-Feb.
L. pulverulentus, *Wall.*, F.B.I.—V-211. Konkan, *Stocks.*
L. tomentosa, *Heyne*, F.B.I.—V-212. On *Phyllanthus emblica.* Near Gairsoppa.
L. Stocksii, *Hook. f.*, F.B.I.—V-213. Sawantwadi. Nov.
L. cuneatus, *Heyne*, F.B.I.—V-214. Mahableshwar. May.
L. longiflorus, *Dessouss.*, F.B.I.—V-214. Deccan. Feb.-Mar.
L. elasticus, *Dessous*, F.B.I.—V-216. Mahableshwar.
L. lageniferus, *Wight*, F.B.I.—V-218. Lanauli. Castle Rock. June-July.
L. trigonus, *W. & G.*, F.B.I.—V-219. Banda. Dang. Aug.-Nov.
L. loniceroides, *Linn.*, F.B.I.—V-221. Mahableshwar. Matheran. Mar.-Apl.
L. capitellatus, *W. & A.*, F.B.I.—V-221.

2. *Viscum.*

V. monoicum, *Roxb.*, F.B.I.—V-224. Londa. Sept.
V. orientale, *Wild.*, F.B.I—V-224. On *Terminalia paniculata.* Nilkand, N. Kanara. Nov.
V. capitellatum, *Sm.*, F.B.I—V-224. Yellapur. Aug.
V. ramosissimum, *Wall.*, F.B.I.—V-225. Mahableshwar. Feb.-May.
V. angulatum, *Heyne.*, F.B.I.—V-225.
V. articulatum, *Burm.*, F.B.I.—V-226. Lanauli. July.

CXXXIII.—Santalaceæ.

S. album, *Linn.*, F.B.I.—V-231. *Chundana.* Gardens widely. June.

4. *Osyris.*

O. arborea, *Wall.*, F.B.I.—V-232. *Lotali Popli.* Deccan Hills, widely.

CXXXIV.—Balanophoreæ.

3. *Santalum.*

B. sp. inc. On roots of *Acacia arabica.* Poona. Oct.
,, ,, *Carissa carandas.* Khandalla. Oct.
B. indica, *Wall.* Mahableshwar.

CXXXV.—Euphorbiaceæ.

Pedilanthus (Tropical America).

P. tithymaloides, *Poit.*, *DC.*, *Prod.* XV.—5. Planted. Jan.

1. *Euphorbia.*

E. pycnostegia, *Boiss.*, F.B.I.—V-246. Hullihul. Khandalla. Nov.
E. zornioides, *Boiss.*, F.B.I.—V-246. Matheran. Nov.
E. elegans, *Spr.*, F.B.I.—V-246. Badami. Aug.-Nov.
E. notoptera, *Boiss.*, F.B.I.—V-246. Vingorla. Nov.
E. erythroclada, *Boiss.*, F.B.I.—V-247. Mawal. Aug.-Sept.
E. coccinea, *Roth.*, F.B.I.—V-248. Diksal. Poona. Rajewadi. July-Dec.
E. Atoto, *Forst.*, F.B.I.—V-248. N. Kanara. Seashore. Feb.
E. linearifolia, *Roth.*, F.B.I.—V-249. Diggi Ghat. N. Kanara. May.
E. hypericifolia, *Linn.*, F.B.I.—V-249. Guzerat. Deccan. Sind. Aug.-Nov.
E. pilulifera, *Linn.*, F.B.I.—V-250. *Nayati.* Deccan. All the year.
E. rosea, *Betz.*, F.B.I.—V-251. Badami. Aug.
E. thymifolia, *Burn.*, F.B.I.—V-252. *Dhakati dudhi. Lahana nayati.* Deccan. Sind. All the year.
E. microphylla, *Heyne.*, F.B.I.—V-252. Deccan widely.
E. clarkeana, *Hook. f.*, F.B.I.—V-253. Sind.
E. Tirucalli, *Linn.*, F.B.I.—V-254. *Shera.* Planted widely.
E. Neriifolia, *Linn.*, F.B.I.—V-255. *Sabur.*
E. Nivulia, *Ham.*, F.B.I.—V-255.
E. antiquorum, *Linn.*, F.B.I.—V-255.
E. trigona, *Ham.*, F.B.I.—V-256. Planted.
E. fusiformis, *Ham.*, F.B.I.—V-257. Poona Hills. April-May.
E. dracunculoides, *Lamb.*, F.B.I.—V-262. *Kandi, Sabur.*
E. Rothiana, *Spr.*, F.B.I.—V-263. *Dudhî.*
E. geniculata, *Orteg.*, *DC.*, *Prod.*—XV-72. Poona, a weed. Oct.-Mar.
E. pulcherrima, *Wild.*, *DC.*, *Prod.*—XV-71. *Poinsettia.* Gardens.
E. heterophylla, *Jacq.*, *DC.*, *Prod.*—XV-72. Gardens. Sept.-Mar.

Synadenium (*C. Africa.*)

S. Grantii, *H. f.*, B. M., 5633. Gardens. Nov.-Feb.

4. *Bridelia.*

B. retusa, *Spr.*, F.B.I.—V-268. *Katki, Asun.* Khandalla. Aug.
B. montana, *Willd.*, F.B.I.—V-269. *Patharphoda.* Amba Ghat. Oct.-Dec.
B. Hamiltoniana, *Wall.*, F.B.I.—V-271. Matheran. Aug.-Nov.

5. *Cleistanthus.*

C. malabaricus, *Muell.*, F.B.I.—V-276. Konkan. Banks of the Shirawah, *Law, Stocks.*

6. *Actephila.*

A. excelsa, *Muell*, F.B.I.—V-282. Castle Rock. Sept.

7. *Andrachne.*

A. aspera, *Spr.*, F.B.I.—V-284. Laki Sind. Aug.

10. *Phyllanthus.*

P. reticulatus, *Poir.*, F.B.I.—V-288. *Nilumbi, Holi, Kamboi, Kalapisaroot, Datwan, Pavan, Kali-madh-ke-jhar.* Dharwar to Sind. Mar.-Apr.

P. Emblica, *Linn.*, F.B.I.—V-289. *Avali, Nelli.* W. Ghats. Mar.-Apr.
P. Lawii, *Grahm.*, F.B.I.—V-290. Castle Rock. Oct.
P. madraspatensis, *Linn.*, F.B.I.—V-292. Badami. July-Aug.
P. Rheedii, *Wight*, F.B.I.—V-293. Gadak. Sind. Aug.-Jan.
P. urinaria, *Linn.*, F.B.I.—V-293. Matheran. Khandalla. Aug.
P. simplex, *Betz.*, F.B.I.—V-295. Dharwar. Konkan. Oct.-Nov.
P. Niruri, *Linn.*, F.B.I.—V-298. Deccan. July.
P. debilis, *Ham.*, F.B.I.—V-299. Sind.
P. scabrifolius, *Hook. f.*, F.B.I.—V-299. Dongar Ganj, Ahmednagar. Oct.
P. distichus, *Muell.*, F.B.I.—V-304. *Harparawri, Raiavala.* Gardens.
P. indicus, *Muell.*, F.B.I.—V-305. Pattagudda, N. Kanara. May.
P. falcatus

11. *Glochidion.*

G. lanceolarium, *Dalz.*, F.B.I.—V-308. *Bhoma.* W. Ghats. Jan.-Mar.
G. tomentosum, *Dalz.*, F.B.I.—V-309.
G. Talboti, *Hook.*, F.B.I.—V-310. N. Kanara, *Stocks.*
G. zeylanicum, *A. Juss.*, F.B.I.—V-310. Yelapur. Juggalpet. Mar.-Apr.
G. Hohenackeri, *Bedd.*, F.B.I.—V-314. N. Kanara. Dec.
G. Ralphii, *Hook. f.*, F.B.I.—V-314. Mwar., near Gairsoppa, *Talbot.* Feb.-June.
G. malabaricum, *Bedd.*, F.B.I.—V-319. N. Kanara Ghats.
G. ellipticum, *Wight*, F.B.I.—V-321. Ainshi Ghats, N. Kanara. Dec.
G. velutinum, *Wight*, F.B.I.—V-322. Londa. Aug.

12. *Flueggia.*

F. microcarpa, *Bl.*, F.B.I.—V-328. *Pandarphali.* May-June.
F. Leucopyrus, *Willd.*, F.B.I.—V-328. *Pandriphali.* May-June.

13. *Breynia.*

B. patens, *Benth.*, F.B.I.—V-329. Khandalla, Yellapur. July-Aug.
B. rhamnoides, *Muell.*, F.B.I.—V-330. Devimana. N. Kanara. Dec.

14. *Sauropus.*

S. quadrangularis, *Muell.*, F.B.I.—V-335. *Chikli.* Vingorla. Aryl Ghat. July.

15. *Putranjiva.*

P. Roxburghii, *Wall.*, F.B.I.—V-336. *Putranjiva.* N. Kanara. Deccan. Planted. Mar.-Apr.

16. *Hemicyclia.*

H. sepiaria, *W. V. G.*, F.B.I.—V-337. Konkan southwards.

17. *Cyclostemon.*

C. confertiflorus, *Hook. f.*, F.B.I—V-341. Katgal. N. Kanara, *Talbot.* Dec.

20. *Bischofia.*

B. javanica, *Bl.*, F.B.I.—V-345. *Boke.* Supa Ghats, N. Kanara. Mar.-Apr.

21. *Aporosa.*

A. Lindleyana, *Baill.*, F.B.I.—V-349. Arbyl Ghat, N. Kanara.

23. *Antidesma.*

A. Ghaesembilla, *Gaertn.*, F.B.I.—V-357. *Papada-Khatambdi.* Londa. Dang. July.

A. Bunius, *Spr.*, F.B.I.—V-358. Near Gairsoppa. Apl.

A. Menasu, *Mig.*, F.B.I.—V-364.

A. Menasu, *var.* linearifolia. Ainshi. N. Kanara. Feb.

31. *Jatropha.*

J. glandulifera, *Roxb.*, F.B.I.—V-382. *Undirbibi.* Pandarpur. Aug.-Nov.

J. nana, *Dalz.*, F.B.I.—V-382. Poona Hills. May-July.

J. gossypifolia, *Linn.*, F.B.I.—V-383. *Vilayati, Ratanjok.* Naturalised widely.

J. multifida, *Linn.*, F.B.I.—V-383. *Coral Plant.* Gardens.

J. curcas, *Linn.*, F.B.I.—V-383. *Mogli Yerendi, Ratanjok.* Planted.

J. podagrica, *Hook.*, DC., Prod.—XV-1093. *Swollen Jatropha.* Gardens. June-Jan.

33. *Aleurites.*

A. moluccana, *Willd.*, F.B.I.—V-384. *Akrot.* Planted.

34. *Croton.*

C. reticulatus, *Heyne.*, F.B.I.—V-386. *Panduray.* Ambe Ghat. Oct.

C. oblongifolius, *Roxb.*, F.B.I.—V-386. *Ganasur.* Nasik, *Dalz.*

C. aromaticus, *Linn.*, F B.I.—V-388.

C. Gibsonianus, *Nim.*, F.B.I.—V-392. Near Gairsoppa. Nov.

35. *Givotia.*

G. rottleriformis, *Griff.*, F.B.I.—V-395. Katriz Ghat. Diggi. Aug.-Sept.

37. *Codiaeum.*

C. variegatum, *Bl.*, F.B.I.—V-399. *Croton.* Cultivated. Gardens.
The garden "Crotons," infinitely variable in form and colour, are varieties of this plant.

39. *Blackia.*

B. umbellata, *Baill.*, F.B.I.—V-402. Gairsoppa. Nov.

B. denudata, *Benth.* Karwar. Potelli. Jan.

40. *Dimorphocalyx.*

D. glabellus, *Thw.*, F.B.I.—V-403. Matheran. Jan.

D. Lawianus, *Hook., f.*, F.B.I.—V-404. Konkan, *Law, Stocks.*

42. *Agrostistachys.*

A. indica, *Dalz.*, F.B.I.—V-406. Tulkut Ghat, *Dalzell.*

A. longifolia, *Benth.*, F.B.I.—V-407. N. Kanara. Feb.

44. *Chrozophora.*

C. tinctoria, *A. Juss.*, F.B.I.—V-408. *Okharada.* Deccan. Guzerat widely. Nov.

C. obliqua, *A. Juss.*, F.B.I.—V-409 Sind, *Stocks.*

C. plicata, *A. Juss.*, F.B.I.—V-409. *Suryavarti.* Poona. Baroda. Apl.

Manihot.

M. utilitissima, *DC., Prod.* 1064 Gardens.
M. Glaziovii. ? Gardens.

45. *Claoxylon.*

C. Mercurialis, *Thw.*, F.B.I.—V-412. Barda Hills. Porebunder.

46. *Acalypha.*

A. Dalzellii, *Hook., f.*, F.B.I.—V-414. Konkan ?
A. indica, *Linn.*, F.B.I.—V-416. *Kupi, Khokali.* Deccan. Dharwar. June-July.
A. brachystachya, *Horn.*, F.B.I—V-416. Panchgany. Aug.
A. fallax, *Muell.*, F.B.I.—V-416. Badami. Aug.
A. ciliata, *Forsk.*, F.B.I.—V-417. Jooneer. Hallihal. N. Kanara. Sept.
A. hispida, *Burm.*, F.B.I.—V-417. *Syn. A. Sanderi.* Gardens. Sept.-Dec.
A. Wilkesiana, *DC., Prod.*—XVI-817.

47. *Adenochlœna.*

A. indica, *Bedd.*, F.B.I.—V-418. N. Kanara. Gairsoppa. *Talbot.* Oct.-Dec.

51. *Trewia.*

T. nudiflora, *Linn.*, F.B.I.—V-423. *Petari.* Banda Warree, Konkan. Dec.-Feb.
T. polycarpa, *Benth.*, F.B.I.—V-424. Konkan, *Law.*

53. *Mallotus.*

M. albus, *Muell.*, F.B.I.—V-429. Castlerock. Nov.
M. stenanthus, *Muell.*, F.B.I.—V-437. N. Kanara, Yellapur. *Talbot.* Sept.
M. Lawii, *Muell.*, F.B.I.—V-438. Khandalla. N. Kanara. Jan.-Feb.
M. philippinensis, *Muell.*, F.B.I.—V-442. *Kunkum-fali. Kunkosaya, Kamala, Sendr.* Guzerat. N. Kanara. Nov.-Feb.

55. *Cleidion.*

C. javanicum, *Bl.*, F.B.I.—V-444. Ainshi Ghat. Yacombi.

56. *Macaranga.*

M. Roxburghii, *Wgt.*, F.B.I.—V-448. *Chanda, Chandada.* Matheran. N. Kanara. Jan.-Mar.

58. *Homonoia.*

H. riparia, *Lour.*, F.B.I.—V-455. *Serani.* Dang. Karwar. Ambi-Ghat. Jan.
H. retusa, *Muell.*, F.B.I.—V-456. *Machim.* Deccan river beds. April.

60. *Ricinus.*

R. communis, *Linn.*, F.B.I.—V-457. *Erendi. Castor-oil plant.* Cult.

64. *Baliospermum.*

B. axillare, *Bl.*, F.B.I.—V-461. Danti. Hareshwar. Konkan. Dec.

67. *Tragia.*

T. involucrata, *Linn.*, F.B.I.—V-465. *Khajakolati, Kolati.* Matheran. Nov.

70. *Dalechampia.*

D. indica, *Wgt.*, F.B.I.—V-467. Katiawad. Dec.

71. *Hippomane* (West Indies).

H. manchinella, *L.*, *DC.*, *Prod.*—XV-1200. *Manchineel.* Victoria Garden, Bombay. May.

72. *Sapium.*

S. sebiferum, *Roxb.*, F.B.I.—V-470. *Pimpalpala.* Gardens. June.

S. indicum, *Willd.*, F.B.I.—V-471. *Hurna.* Planted.

S. insigne, *Benth.*, F.B.I.—V-471. *Ura*, *Dudla.* Lanauli. Konkan. Dec.-Feb.

73. *Excœcaria.*

E. agallocha, *Linn.*, F.B.I.—V-472. *Geva*, *Surund Phungali.* Tidal marshes. July-Aug.

E. robusta, *Hook. f.*, F.B.I.—V-474. Konkan, *Stocks.*

74. *Sebastiana.*

S. chamaelea, *Muel.*, F.B.I.—V-475. *Bhui-erendi.* Rutnagiri. Vingorla. Oct.-Dec.

Hura (Trop. America).

H. crepitcons, *DC.*, *Prod.*—XV-1229. Poona. Khandalla. Planted.

ON SOME SUPERFICIAL DEPOSITS IN CUTCH.

By the Revd. J. F. Blake, M.A., F.G.S.

Part II.

(With a Plate.)

(Continued from page 183 *of this Volume.)*

THE ASSOCIATED BOULDER BEDS.

These are not mentioned by Mr. Wynne, unless he refers to them in the passage quoted above when he writes of the concrete that it is "sometimes conglomeratic" (*op. cit* p. 81). As no æolian deposit can be in itself conglomeratic, these boulder-beds require explanation.

I will first describe the three localities where I have observed these beds. The first is in the banks of a river running out from the Habo Hills at Fulae near Kotae, where the subrecent concrete has been above recorded. Here we find the following section (see fig. 1) :—

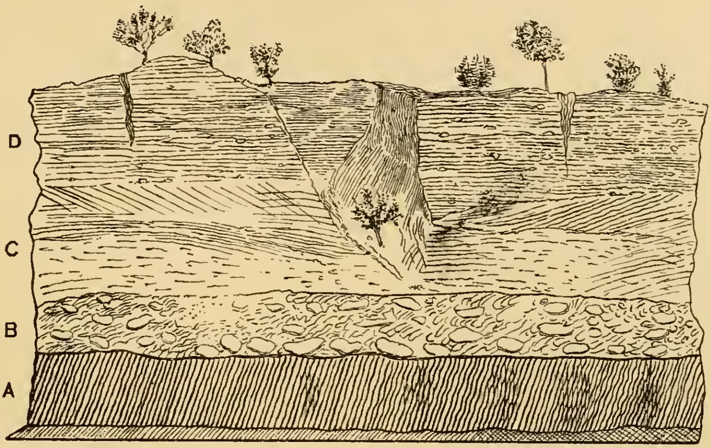
Fig. I.—*Section on stream west of Kotae.*

A—Oxfordian.
B—Boulder-bed.
C—False-bedded concrete.
D—Smaller boulder-bed.

The bed of the river and about 4 to 6 feet of the vertical sides are composed of Oxfordian shales dipping at a very high angle. Their surface, except for the river-erosion, is nearly flat, and immediately on the top lies a 5-foot bed of rounded and subangular stones, from the size of a quarto book downwards, embedded in a fine loamy material without any stratification. The boulders lie irregularly jumbled together, with a tendency however for the long axes to lie horizontally, so that the deposit has very much the aspect of a boulder-clay. Over this comes 7 to 8 feet of false-bedded concrete, and then follows another boulder-bed 5 to 12 feet thick up to the top of the cliff, in which the boulders are smaller, about the usual size of coals in a scuttle. All the boulders, so far as observed, can be matched in the neighbouring hills. The stratification is approximately horizontal ; but the boulders only commence some way down stream, away from the outer slopes of the hills and below the spot where the *Miliola*-bearing concrete is seen resting directly on the Jurassic rocks.

The second locality is on the south side of the Jhurio Hills, in the concrete-filled gorge and beyond. The description of these deposits would be practically a repetition of the last—only the thicknesses are somewhat greater, and the bed-rock is not reached in the stream-bottom, where the boulders are seen in the sides.

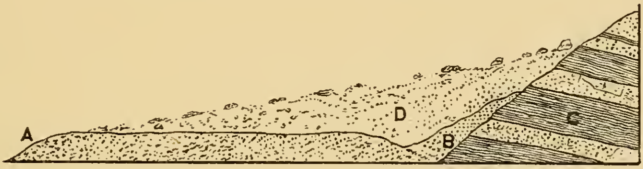
Fig. 1. *Section on stream west of Kotae.*



A = Oxfordian.
B = Boulder bed.

C = False bedded concrete.
D = Smaller boulder-bed.

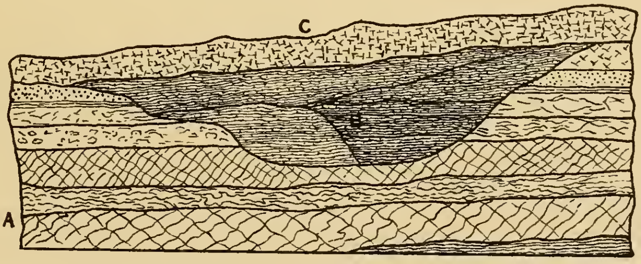
Fig. 2. *Boulder-beds in the north of Patcham.*



A = Boulder-beds.
B = Subrecent concrete.

C = Jurassic rocks.
D = Hypothetical former extension of concrete with boulders.

Fig. 3. *Infratrappean grits at Bhujia Hill.*



A = Jurassic rocks.
B = Infratrappean grits.

C = Trap.

The third locality is a more remarkable one, namely, that on the north side of the Kala Dongar in Patcham. It was here that the boulder-beds were first noticed, and called loudly for some explanation. At this spot there are marked on the map of the Trigonometrical Survey two long projecting elevations running out at right angles from the Jurassic escarpment, where it is coated with the subrecent concrete. These no doubt were originally one, the end having been eroded along the dividing watercourse. Their length is $\frac{9}{10}$ mile, the united breadth $\frac{1}{2}$ mile,:and their elevation (not marked on the map) is perhaps 100 to 150 feet above the plain. They have the general aspect of the tip-heaps of a cyclopean railway embankment in course of construction. As seen weathered on the surface, they are covered with large fragments of rock from $\frac{1}{2}$ cwt. downwards, more or less rounded, but not scratched, and all to be apparently matched in the neighbouring Jurassic hills. Where a section is seen the matrix is rubbly, more or less tufaceous, and tough enough to form a cliff. At the base of the valley laterite is found, and the long mounds appear to rest upon it.

In the first two localities the stratification in alternate boulder and non-boulder-bearing beds may be without discussion assigned to the action of the streams when they were depositing and not eroding; but in all three cases the difficulty is to account for the carriage of the large stones and their promiscuous heaping together. The principal agents that have been supposed to possess sufficient transporting power are ice, torrents, and sea-waves. In a place where the present range of temperature is between 70° and 120°, it is scarcely feasible to call in the aid of ice, and certainly sea-waves are out of the question. In the first two, and localities where the boulder-beds filled up the bottom of valleys at the end of gorges leading out from lofty domes, the bottom beds may be fairly ascribed to the force of the water, with or without further aid; but those which overlie the soft concrete could scarcely, one would think, be borne along in so rapid a torrent that they could not even be sorted without that torrent eroding the surface below.

For the third locality, however, there seems no possibility of calling in the aid of a torrent, as there is no gathering-ground for the water. The whole history of the deposit must at the outside be confined within an area of $1\frac{3}{4}$ square miles, on which a line no longer than 21 miles can be drawn with a maximum difference of elevation of 1,150 feet. But the mounds point in the direction of the scarp only $1\frac{1}{4}$ miles distant, and whose highest point is only 640 feet above their surface, and for three-quarters of this distance the boulders occur. Nor do they fill up a valley, but form mounds on a flat surface. The only area whence the water could be obtained to form a torrent would thus be the slopes of the hills opposite the mounds, with an average fall of only 320 feet. This appears to me quite inadequate to produce a torrent sufficient to carry large stones over a nearly level surface for $\frac{2}{10}$ mile. If we take the longer oblique line and greater height, the difficulty is found to be not lessened but increased.

In the 29th volume (1873) of the Journal of the Geological Society, p. 493, Dr. W. T. Blanford describes similar deposits on a far larger scale in Persia. Here there are boulder-ridges extending for 5 to 10 miles from the foot of the hills, with a fall of their upper surface in that distance of 1,000 to 2,000 feet. He says that the large fragments are commonest near places where small streams issue from the higher ranges, but the mounds increase in quantity towards the north and east, where the rainfall is less. I thought that this last fact would have led the author to enunciate the theory which I am about to expound, but he argues only that there must have been a greater rainfall in past times, and that lakes were thus produced—without saying how even then these boulders could have been transported for 5 to 10 miles with so little fall.

In Cutch these boulder-beds occur only where there are deposits of æolian origin ; and in Persia they are most abundant where there is less rain and therefore presumably more dry sand to be blown about, so that some connection between the two is suggested. It appears to me that if we suppose that at one time there was more blown sand present so as to make a greater slope, the weathered blocks which fell on it from the hills would, under the influence of the rains saturating the sand below, slip gently forward along the slope, supported by the underlying sand, till they reached their farthest destination without sinking to the bottom. Thus the æolian deposits have served as the carrier (see fig. 2).

Fig. 2.—*Boulder-beds in the north of Patcham.*

A=Boulder-beds.
B=Subrecent concrete.
C=Jurassic rocks.
D=Hypothetical former extension of concrete with boulders.

This explanation is analogous to that made use of by Sir Wyville Thomson to account for the forward motion of the stone-river in the Falkland Islands[*]; and, if it be a true one, it is possible that it may in some cases account for deposits of loose blocks which have been referred to glacial action. There will always be antagonism between this process and the running away of the water in definite channels, and at last, when the slope of the æolian deposit became too low, the growth of the mounds would cease and the streams would begin to sensibly denude the deposits, and even cut channels in the bed-rock It might be thought that all along the rain would wash the sand away and let the boulders drop, but we see that as a matter of fact it does not ; besides which, the boulder itself protects the sand below it, as in the case of earth-pillars, and what is washed away above or below will be replaced by the next dust-storm.

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[*] " Nature," vol. xv (1876), p. 359.

(3) INFRATRAPPEAN GRITS.

These deposits, lying as they do below the traps, cannot in strictness be called superficial, but it will be seen that they were probably of that character—that is, deposited on the land before the traps were poured on the top of them. This is what Mr. Wynne says of them:—"These form a peculiar, soft, loosely granular, and obscurely stratified group of earthy and sandy rocks, largely composed of trappean materials . . [they] are frequently associated with the base of the stratified traps, but they also occur in separate patches over the country, and sometimes at a considerable distance from them. They are clearly beneath the trap in some localities ; in others they fill up hollows in the Jurassic beds, the planes of stratification not being conformable even to the surfaces of the hollows which they occupy."[1]

In the detailed description, however, I can find only eight places where they are recorded, namely, west of Bhachau, Bhujia Hill, two places north of Katrod, Rhojla Hill, "Khirgreea," Rampur, and Lakhapur. The letter *d* by which they are indicated is also marked on the map at Sanosra and west of Mundhan. Of these, one of the localities obviously represents, by the description, some fault-rock only ; that at Lakhapur and west of Mundhan is related to an intrusive mass of igneous rock which the deposits do not underlie, but merely abut against, so that they may possibly belong to the subrecent concrete. Of the deposit at Rampur, it is stated that "it may have been the basal portion of the trap series." It is not connected with the trap of the neighbourhood, and consists of "scoriaceous lumps of trap mixed with sand," etc., so that this also may be an old variety of subrecent concrete. Of the other deposit north of Katrod, we read that beneath the trap is "a hard bed of black ferruginous grit ;" it therefore contains no trap-fragments, and may perhaps be dismissed as doubtful. There remain therefore five spots where peculiar deposits are actually found below the traps, with a sixth at Artara, unrecorded by Mr. Wynne, and in no case are they large enough to map.[2]

These six may also be grouped together, for those at Artara and at Sanosra are of the same character, and those at Khirgreea and Rhojla Hills are described as similar to that at Bhujia Hill. There are thus, with that west of Bhachau, three types of such deposits.

I have thought it necessary to thus analyse the evidence on account of the statement that they are "largely composed of trappean materials," which is difficult to understand if they are *infra* and therefore presumably pre-trappean.

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[1] Mem. Geol. Surv. India, vol. ix. pt. i (1872), p. 56.

[2] On Mr. Wynne's map there is marked a considerable expanse of infratrappean rocks in the neighbourhood of Bhachau, but there is evidently something wrong here. A distinct unexplained colour is inserted, and the details do not correspond with the text. Moreover, the deposits are not overlain by the traps.

We will first examine the deposits on Bhujia Hill. The following are the only two sentences in Mr. Wynne's memoir which give us his description of them :—"To the eastward from beneath the highest summits, the basalt is underlaid by, and intercalated with, a rapidly increasing mass of soft (?), ashy, sandy rock of greenish-yellow colour, passing in places into a hard siliceous trappoid sandstone of coarse texture, containing fragments of woody plants. . . . . From Bhujia to the conical sandstone hill on which Soorul temple stands, and near the latter, the subtrappean grits are occasionally seen ; the trappean blotches and interstitial portions weathered out into little cavities on the surface of the rock, which sometimes occupies pockets or wide fissure-like spaces in the underlying Jurassic."[1] With this description I am in perfect agreement ; but the accompanying map and section do not correspond to it, and I am at a loss to understand them. It will be seen that, beyond calling some of the rocks "? ashy" and "trappoid" and speaking of "trappean blotches," the author speaks of nothing but grits. It is true that in some parts they are so much and so irregularly discoloured, apparently by infiltration, that they then bear a superficial resemblance to some rocks of volcanic origin, but their essentially gritty nature is unaltered.

The best exposure is on the northern slope of the hill, where the section shown in fig. 3 is seen. Here the bulk of the hill is composed of the Jurassic sandstones, which on the western side rise up and meet the capping of basalt. East of this junction there comes in rapidly a series of thick beds of very porous character, all of which are laminated, but not conformably to the base on which they lie. Their porous character gives them a very "asby" appearance—that is, the appearance of fine debris deposited in the open air ; but they are almost entirely composed of sand-grains lying in a loose matrix of finer dust, and are so like some of the samples of subrecent concrete that without labels they can scarcely be distinguished in hand-specimens. The laminæ run up to and meet the basalt above, and as we pass eastward the deposit becomes thinner till the basalt and Jurassic sandstones come together again. The other patches referred to as lying in the open hollows are generally darker and more compact, but they are still sandy. The isolation of this and similar deposits at Khirgreea and Rhojla, its occurrence in a shelter-spot on an old Jurassic hill, its porous character and sandy composition,—all point to an æolian origin, representing as they do the same conditions as those represented by the subrecent concrete.

The second type of deposit at Sanosra, due south of Bhuj, and at Artara, between the Jurassic rocks and the trap, is simply a collection of stones derived from the rocks below, cemented by finer material, and lying in hollows over which the trap passes ; that is to say, it is the surface-debris of the land on which the lava was poured out.

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[1] *Ob. cit.* p. 168.

The section west of Bhachau, which appears to show a third type, I have not seen, as at the place where alone I was able, from lack of more time, to examine the trap, it was lying directly on the Jurassic rocks, showing, as pointed out by Mr. Wynne, the very local character of the subtrappean group. I therefore copy here the description in the memoir (p. 136) of the beds referred with a query to this group, as taken from Mr. Fedden's notebook :—

	Feet.
" 7. Brecciated and conglomeratic bed, lower part almost wholly of pink lava (?)	3
6. Yellow sandstone	2
5. Conglomeratic and concretionary bed of pale lavender and pink lava (?), with large pebbles of hornstone, fragments of yellow clay, and fine sandstone	1-4
4. Hard, yellow and pinkish, gritty sandstone	5 "

It will be seen from this description that the only ingredients which could not be derived from the Jurassic rocks are the fragments of " pale lavender and pink lava (?) " I think it is very doubtful whether these are really volcanic fragments. Even Mr. Fedden queries them, and as the large area south of Bhachau, mapped as trap, is now seen in the cuttings of the new road to be entirely lateritic, it is more probable that the fragments here noted are also of that character. Perhaps, however, it comes to the same thing if laterite is derived from trap, in which case the basalt of Bhachau must be one of the later flows. The stratification also of these deposits indicates the agency of water, so that we may perhaps sum up as follows :—

The subtrappean rocks are all superficial deposits on the pretrappean land-surface, those at Artara and Sanosra, being the ordinary results of weathering; those at Bhachau, the washing-down of similar debris on to a lower water-covered level; and those of Bhujia Hill, etc., æolian drift.

Taking this last in connection with the subrecent concrete, we have thus a record of the constancy of the meteorological conditions in Cutch from recent times as far back as the Cretaceous epoch.

(4) THE LATERITE.

The deposits hitherto dealt with are on a small scale and more or less peculiar to Cutch, but those which remain to be discussed are widely distributed in this part of India.

The various deposits which in different parts of India have gone by the name of laterite are, with exceptions, superficial in origin. As however the term has been so widely applied that the only definition which will cover all the varieties is that it is a very ferruginous rock of peculiar character, it follows that the rocks included under this definition may be of many origins and of many ages. All the laterites of Cutch are classed and mapped by Mr. Wynne as "sub-Nummulitic," so that they stand, with those of the Nerbudda Valley near Surat, as the only laterites which lie below well-defined marine deposits.

That there are lateritic beds below and associated with the Nummulitic series in Cutch admits of no dispute; but those whose age can thus be proved all lie on the south side of the trap-escarpment and rest immediately on the trap itself, where there can be little doubt that the lower red earthy varieties are the products of decomposition *in situ.* It is with an entirely distinct area that I am concerned, where the laterite is separated from the trap by miles of intervening Jurassic rocks and Ran, and is overlain by nothing but alluvium. That these also are sub-Nummulitic depends on the assumption that all the lateritic deposits in a province as large as Cutch must necessarily be of the same age—an assumption which does not appear to me to be warranted.

The superficial group of laterite is found only on the southern and western margins of the Ran islands and along the northern border (and eastern also according to Mr. Wynne) of Wagir. In the course of this range it is found lying on various members of the Jurassic series. In the north of Patcham it lies on the oldest, in the north of Wagir on the youngest, and on intervening members at other places.

This distribution indicates, I think, a later age than the Nummulitic rocks, for these latter rest upon the decomposition products of the trap, which do not require long to form, and they nowhere extend to the Jurassic rocks, as they surely must have done, if these had been already denuded to any great extent. Whereas, before these laterites were produced, not only must the lowest Jurassics have been exposed by denudation, but the general contour of the country have been not far different from what it is at present. The only indication of age that I can quote is that they underlie the boulder-beds in Patcham.

The laterite here is a sort of gravelly deposit, the pieces being of fantastic shapes with a crinkly surface. They are dark red or black, in colour, and consist of concretionary and stringy ferruginous matter, more or less closely sprinkled with sand-grains. The several pieces often interosculate into a vacuous spongy mass, in which case the rock so closely resembles some of the higher members of the Jurassic series as to be undistinguishable in hand-specimens. In certain well-defined spots the surface of the ground is covered with small, irregularly-shaped, and obviously detrital agates, sometimes white and sometimes tinged yellow and red. These ferruginous beds are frequently seen to overlie well-stratified, soft, white sandstones and earthy beds, which are tinged with pink and purple by the infiltration from the laterite, as seen by the stalactitic form of the coloured parts (see fig. 1, p. 69 of Mr. Wynne's memoir).

Deposits of this kind are mostly found at levels relatively low as compared with the surrounding Jurassics, and they seem to be limited to a level lower than about 120 feet above the Ran. They are only found inland at spots which would become lakes if the water-level were restored to that height.

From the preceding observations we may safely conclude that

(i) this laterite and its associates were formed in water ;
(ii) they are not the result of the decomposition of any rock *in situ* ;
(iii) they are detrital in origin ;
(iv) they were formed at a time when the surface of the country was not very different from what it is at the present day, but when the water-level was 120 feet or more higher than now.

As to the source of the detritus, the materials of the sandstones, etc., might easily be procured from the higher Jurassic rocks, and the iron of the laterite itself could be found abundantly in the same beds or in the lower Jurassics—though possibly not in a state suited for solution. But we cannot derive the agates thence, and agates and iron probably came together. Agates are abundant in certain of the lower flows of trap, and to such rocks we must look for the source of the laterite. Now, as the "stratified traps" are flows without pipes, and in the Jurassic area to the north of them there are several pipes without flows, it has been natural to connect the one with the other ; and if the southern traps were emitted from these pipes, there must have been flows also to the north. Here, however, is a sharp anticlinal visibly bringing in the higher Jurassics, so that the relics of such flows would now be hidden beneath the Ran ; and it is from the degradation of these flows that we may best seek the source of the laterites. This would account for their occurrence on the north side, but not on the south side, of the inner Ran.

In the absence of any organic remains, it is impossible to say whether they are marine or lacustrine deposits. Their resemblance to the higher Jurassic rocks which have associated plant-beds points to the latter, in which case we may call in the aid of vegetation, as suggested by McGee and by Mallet ; but as there are other deposits which have a similar distribution, and yet contain remains of apparently marine shells, and as moreover a depression is easier to imagine than a barrier, the former becomes at least equally probable.

(5) THE ALLUVIUM AND RAN.

The area marked as alluvium on Mr. Wynne's map is a very large one. It occupies no less than 800 square miles. A large portion of it, however, lies along the southern margin of the province, overlying fossiliferous Tertiary rocks, and it is to this portion that I think Mr. Wynne's description must especially apply when he says that "it is the result of the degradation of the local rocks, consisting largely of materials derived from the Tertiary beds frequently mingled with travelled fragments brought by rivers from the hills. On this part of the alluvial area I have nothing to say, but of those parts which are in relation to the Jurassic rocks the above is scarcely a suitable description. In these I have found no evidence that the materials are specially of local origin or of Tertiary derivation, and no travelled fragments have been anywhere seen by me. The history, in fact, of these portions must be somewhat exceptional and instructive.

The alluvium comes into relation with the Jurassic rocks (except in the lateritic and a few other, possibly marine, patches of similar age, which have contributed no recognizable elements to it) in the broad flat area which joins the mainland of Cutch, north of Bhachau, to Wagir, continues round the western and northern sides of that district and unites it to Bela, skirts the south-western sides of the islands of Kharir and Patcham, and forms patches here and there along the northern coast of Cutch proper. With the deposits of this area must be classed about 650 square miles of lower-lying land, still occasionally flooded, known as the Bani, which lies in the middle of the area between the mainland and Patcham, and the deposits on the floor of the Ran, which may be divided into the inner Ran, south of the islands, and the outer or Great Ran, north of them. All these areas pass insensibly into each other, being merely distinguished by the relative heights of an undulating surface above the general level of the sea.

In the area mapped as alluvium there are parts which become muddy in the rains, and these pass gradually into Ran ; but a larger portion is sandy soil, which soon becomes dry, including vast tracts where the sand is all loose and where no amount of rain can remain for an hour on the surface.

The characteristic deposit of the Bani is a very fine micaceous silt, and the surface is dotted over with groups of trees which stand round the margins of artificial tanks, or near the wells which are known to be abundant here. The surface of the Ran, in the wet season, is everywhere covered with the slimes of muds, on which the camels can scarce maintain a foothold ; but this is probably underlain by a firmer, perhaps sandier deposit, as below the first two or three inches the ground is firm and may be easily traversed while covered with water.

Before attempting the history of this strange area, attention must be drawn to the further features which may help to elucidate it. One of the most important of these is the aspect of the Ran where the alluvial deposits are, absent. It has been shown long ago by Dr. Blanford [1] that both the Ran and the sandy desert on the north of it may be reasonably concluded to have been formerly occupied by the sea, and the latter to have been since more or less choked by blown sand. Mr. Wynne[2] quotes the numerous statements that have been made that the Ran was navigable and provided with various ports within the period covered by native traditions, though in describing the Kharir cliffs (p. 106) he appears to be doubtful of the geological evidences. In one place in Patcham (*op. cit.* p. 27) he quotes a deposit with "marine shells nearly 20 feet above the Runn" as " traces of this old sea"; but elsewhere he states that these "shells" are casts and may be "very new Tertiary." They are therefore no evidence that before the sea left in comparatively recent times, it stood 20 feet higher than the present surface of the Ran.

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[1] Journ. Asiat. Soc. Bengal, vol. xlv, pt. ii (1876), p. 86.

[2] Mem. Geol. Surv. India, vol. ix., pt. i (1872), p. 26

Standing by the edge of the Great Ran, on the northern shore of Patcham, Kharir, or Bela, one might fancy oneself looking over flats which have just been deserted by the tide. Save for the absence of the scraps of sea-wrack and the greater firmness of the mud, there is little to distinguish the appearance from that which might be seen along the coast of Britanny and Normandy between St. Malo and Mont St. Michel. Here, too, are the clean swept foreshore, the low cliffs on its landward margin,[1] the broken tumbled masses on the slopes, and the frowning scarps above—all recalling the aspect, though wilder in type, of the Undercliff of the Isle of Wight, where the lie of the strata also is the same as it is here. But, since the formation of the laterites and other minor deposits, there is no evidence that the sea has stood at a higher level than when it washed the low cliffs that now edge the Ran.

Why then has the sea departed, as it were yesterday, and left its bed to be dried up by the sun? Two explanations are possible: either the sea has been dammed out of the area by deposits on its surface, or the land has relatively risen. If the former were the sole explanation, the level of the borders of the Ran would still be uniform. But, according to the figures on the Trigonometrical Survey maps, it would require a depression of about 30 feet to bring the sea-water to the edge of the inner Ran along the northern shores of the mainland, whereas on the edge of the eastern side of Kharir it would require no more than 5 or 6 feet. The land therefore must have risen unequally, which is not an improbable counterpoise to the depression that has taken place over the Sindree basin.

But that deposits also have taken place and that the peculiarities of the Ran results from these will, I think, appear probable from what follows:—In the first place the Ran proper is extraordinarily level; this may be seen from the figures on the Trigonometrical Survey map, where, over wide areas, we find 1, 3, 5, 4, 8, 11, 12 feet, showing a difference of very few feet, and I have myself ridden over 10 miles of it in the rainy season with water on it almost all the way of never greater depth than the knees of the coolies. Yet, beneath the lofty scarps of Patcham and Kharir with their broken undercliff, the shores are swept quite clean, and the débris must have been carried away when these shores were in the making, and when the small cliffs, sometimes 30 feet in height, were being worn away. Now, in such a shallow sea as the Ran would be if the water returned no waves or currents could originate, nor would the harbours, of which tradition tells, be restored, and I conclude that in former times the bottom must have been deeper and have been since filled up.

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[1] I do not specially quote in this connection the curiously worn cliff figured by Mr. Wynne as "? sea-cliff," because it happens to be composed of irregularly hardened sandstone which even inland weathers into similar fantastic shapes, as near Mundhan.

Again, the Ran is traversed by no rivers; some of those from the northern side of the mainland reach its edge, and the projecting higher alluvial land in their neighbourhood may be taken to represent their deltas. But the great majority begin and end without reaching it. At the lower end they break up into constantly sub-dividing branches, which dwindle away to nothing. In this latter case all the water which runs even during the heaviest rains is absorbed by the porous soil, and sinks in before it can reach the Ran; in the former case the quantity and velocity of the water are too great for this to be entirely effected, and the remaining water spreads out in a broad sheet on the surface, and so helps to flood the Ran. In the higher parts of the Bani and in the alluvial area west of Wagir, there are a number of short nullahs, which begin and end in the middle of a flat surface, and sometimes follow each other in a broken line. They indicate the course of underground streams, the roofs of which have fallen in and exposed them in places. Such an underground course must be due to the original valley being filled in with loose and porous material, into which the water sinks. This it may be actually seen to do with great rapidity. I have known 4 inches of rain to fall in the course of a night, and the rivers to be torrential in the morning, but before evening to be all dry again; and one can watch the water sinking in on the bottom of their beds.

The nature and origin of these deposits can also, I think, be determined. With regard to the Bani, as it is separated both from the mainland (except at the two extremities) and from Patcham by an area of Ran, it can hardly be "a bank formed...by the discharge of the Cutch streams," while the fine micaceous silt of which it is composed could scarcely be obtained from thence. Its composition and the power which it has of retaining water indicate rather that it is a relic of the sea-bottom, corresponding perhaps to a higher level of the submerged bed-rocks. The highest part of the alluvial area between Wagir and the mainland lies in the direct line of an anticlinal which passes from one area to the other, and is doubtless continuous. This may have originated the higher level here.

With these two exceptions, the whole of the features may be put down to the wind and rain. The importance of the former may be argued from the wide sheets of loose sand that lie to the west of Wagir and on the south-western edges of the islands. These are comparatively scarce on the margin of the mainland, and entirely absent along the northern island-coasts; that is, these sands occur where the prevailing strong winds will be stopped, and are lacking on the lee of high grounds. Moreover, the rivers that reach the Ran on the north side of the mainland (with one exception where there is higher Tertiary ground to the west) are deflected to the west by the accumulation of sand, etc., on the east ; hence the distribution of this sand may be assigned to the wind. Nevertheless, much of the dust that is carried by the gales must fall *en route* and beyond the lee of the hills. Here, however, it will be covered by water during the rains, and the finer particles will come to the surface and form the mud, but the ground as a whole will be fairly firm.

The amount of deposit from rivers must be comparatively, if not very, small. Doubtless much of the material is brought down in the first instance by the Indus and other rivers, but from the neighbourhood of their mouths this has been blown about in an easterly and northerly direction, and has thus afforded a constantly renewed source of fresh fertility.

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THE BIRDS OF THE ANDAMAN AND NICOBAR ISLANDS.

By A. L. Butler, F.Z.S.,

Curator, Selangor State Museum.

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Part I.

The publication of Mr. Blanford's long-expected fourth volume of the "Birds of India" enables me to contribute to the Society's Journal, arranged in accordance with the latest classification of Indian Birds, the notes on the avifauna of the Andaman and Nicobar Islands which I made during a recent stay of nine months in those groups.

Mr. Hume's long papers on the ornithology of the islands ("Stray Feathers," Vols. II and IV, 1874-76) being now exceedingly difficult to obtain, I have done my best to make this as far as possible a complete list of the birds hitherto recorded as occurring in the islands. Not having access, however, to any large ornithological library—the great difficulty of a field naturalist—I have had to do my best with Vols. II and IV of "Stray Feathers," the invaluable Bird Volumes in the "Fauna of India," and my own field notes. Hence I fear that I may have omitted a few species through having been unable to search the back volumes of the "Ibis" and the remaining volumes of "Stray Feathers" for scattered notes on Andaman and Nicobar ornithology.

The gleanings from a field worked by men like Hume and Davison are necessarily small, but I believe that some species are here recorded from the islands for the first time, and that the notes on some of the birds peculiar to these two groups, such as *Rallina canningi*, *Sturnia erythropygia*, etc., will be of interest to naturalists. The discovery of a beautiful new Goshawk on Car Nicobar, probably peculiar to that one small island, is noteworthy and was quite unexpected.

I was at Port Blair from May, 1897, to February, 1898, and worked that locality very thoroughly, but the other parts of the Andamans I was unable to visit : these islands, however, lie so close together that the same birds are met with throughout the group.

In the Nicobars I visited the central islands of Camorta, Nancowry, Teressa, and Katchall, and on Car Nicobar, the most northerly, I collected for six weeks.

To my great disappointment I was unable to visit the Great Nicobar, the interior of which still remains unexplored, and on which, from the large size of the island, it is probable that some new species will in time be found.

It is impossible to work these islands properly without a boat of one's own. Port Blair being a convict settlement no shipping is allowed in the vicinity, while the Nicobars are only visited, besides the short official visits of the R. I. M. steamer stationed at Port Blair, by a few Burmese and Chinese buggalows and junks trading in cocoanuts, and these do little travelling about, but lie for months off the same island until they have got together a full cargo.

The best plan for a collector would be to hire a small sailing ship and visit the islands in the fine months of February and March.

Ornithological collecting in the Andamans is not very easy; the rainfall is excessive; the trackless jungles are the most abominably dense and thorny that I ever saw, and the atmosphere inside them is so intensely steamy that forcing one's way through the tangled undergrowth is fatiguing in the extreme. I know no place where nests are more difficult to find.

To a casual observer the most noticeable feature in these Andaman forests is the abundance of the Gurgeon trees, whose straight and lofty stems rise like countless tall white masts among the dark green cover of luxuriant vegetation which clothes the hills. Inside the jungles the almost entire absence of mosses (excepting some small and inconspicuous kinds) is very remarkable. The absence of monkeys and squirrels, &c., is very striking.

The geographical position and physical aspects of the islands have been so often described that no remarks on these are necessary here.

Port Blair is, as Mr. Hume remarked twenty-four years ago, as well-known as Southampton Water; the Nicobars, however, are further from the beaten-track, so I give a few notes on my stay among the islanders whom I found most friendly and hospitable though very lazy and apathetic when I tried to get any assistance from them. At whatever villages I visited I was always made welcome, and received with offers of young cocoanuts, cigarettes, etc. The latter are not a strong form of smoke, being composed of a little China tobacco rolled up in a long strip of *Pandanus* leaf, the tobacco being in about the same proportion to the *Pandanus* as the lead to the wood in an ordinary pencil.

The manner in which some of the Nicobarese have, with hardly any intercourse with Europeans since the abandonment of the settlement at Camorta, kept up their curious pidgin English does them great credit. The more intelligent of them have an insatiable thirst for knowledge, and some of their questions are decidedly amusing. For instance, it was rather startling to be asked in the year of Jubilee 1897 "Who got England Chief Commiss'? Colonel Temple brother? I think so!"

Many of their enquiries are personal in the extreme. They nearly all want to know whether you are married, and if not why not, and so on. My name they rendered with every imaginable variation from "Buttala" to "Pot-luck," and they absolutely declined to accept my plea of impecuniosity as a satisfactory explanation of my state of single blessedness.

The pride of the Nicobarese in English names is well known. The ugliest man on Car Nicobar, with hideous projecting teeth covered with horrible incrustations of betel, rejoices in the name of "Sweet William," and many other names testify to the delicate irony of the officers of the Andaman Commission.

There is a tale of a ship-wrecked crew, who, huddled together at night on the beach of one of the Nicobars, heard the sound of paddles and then voices and approaching footsteps. Fully expecting to be attacked they sang out to the newcomers in good nervous Anglo-Saxon to keep their distance. History hath it, that the reassuring reply received was "What for you fraid me! I not eat man! My name Lady-killer!"

I lived for a week with one Kingfisher, headman of a village called Perka, where I got the new hawk. I found him by far the most intelligent man on the island, and he gave me a great deal of help, besides most hospitably moving out of his house to make room for me, and bringing me fowls, yams, &c.; his willingness to assist, unlike that of his neighbours, outlasting my stock of rum.

One day a deputation from the village of Kakana came to ask me to come with my gun and capture or shoot a man who had run *amok*, which seemed to promise a little excitement. They complained that he had fired a house and killed a lot of pigs with his *dah* and threatened to cut down the first man who interfered with him. On enquiry as to whose house he had burnt, they said his own. Further questioned, they admitted that the deceased pigs also were his own property. I came to the conclusion that a punitive expedition was unnecessary.

The Nicobarese ought to be among the most contented people in the world. Every one lives on terms of perfect equality with his neighbours. Beyond occasional illness they have no cares or troubles, and there is absolutely no struggle for existence, cocoanuts and *pandanus*, their staple foods, being in such profusion that a child old enough to climb a tree could support himself without exertion.

The marriage relations are very loose, but for all that seem to work very smoothly. As long as a couple are fond of each other and agree they live together; if they get tired of each other they separate and marry again. There seems to be no objection to an unmarried girl having as many lovers as she likes. The place would interest Mr. Grant Allen immensely.

There is generally some sort of festivity going on, principally canoe racing and dancing. A pair of the large racing canoes from Chowra manned by twenty-five or thirty men make a fine sight, but their pace suggests unfavourable comparison with the speed of an English racing eight. The course is generally long, and as every one sings at the top of his voice throughout the race, the performers are pretty well exhausted at the finish. Both canoes keep nearly parallel, and no one seems to mind much which comes in first.

Dancing is carried on every fine night, the performers making a large ring with their hands on each other's shoulders, the men on one side and the girls opposite them on the other. They do not dance round, but take two or three paces and a stamp to one side and then to the other. If the dancers are few in number the ring is left one-third open rather than made smaller.

Toddy goes round freely and by midnight every one is more or less intoxicated and consequently fuddled and stupid next morning. When heavy rain prevents dancing the Nicobarese make the best of it and lie beside their nectar inside their huts.

Wrestling is rather a favourite sport between the lads. The rounds are very short, one or the other going down at once.

The Nicobarese did not seem to me very good fishermen, and I did not see a single fish of any size captured during my stay. I noticed four methods of fishing—by hook and line, netting with a small casting net, spearing fish by torch-light, and killing the small fry left in the pools at low tide with an intoxicant made by mashing up some jungle fruit which I could not name.

Mr. Hume's account gives one a capital idea of the islanders excepting on one point. Mr. Hume gives one the impression that the Nicobarese are partly amphibious, diving from their canoes and catching large fish, sometimes two at a time, in their hands. The Nicobarese of the present day certainly are unable to do anything of the sort. I questioned many Nicobarese on this point, and none of them seemed at all familiar with this method of fishing; in fact, the idea rather tickled them. The officer in charge of the Nicobars, who knows more about the islanders than any other man living, had never heard of it either ; and when I found Captain London, still hale and hearty, though growing old, the very man whom Mr. Hume describes as "diving stark naked from his canoe and bringing up fish in his hands"—and *he* too had never heard of this style of angling—well, it *did* occur to me that Mr. Hume had for once been enlivening his ornithology with a touch of romance, but I dismissed the thought at once as disloyal to the greatest of Indian ornithologists ; *tempora mutantur*, and perhaps the Nicobarese are changing with them.

I have to thank Col. R. C. Temple, C.I.E., Chief Commissioner of the Islands, for much assistance kindly rendered, and I am, I think, indebted to nearly every Officer in the settlement for kindness and hospitality shown me during my visit.

I will now proceed with the ornithological part of this paper, which, it will be seen, is chiefly a comparison of my observations with those of Messrs. Hume and Davison in 1873.

The numbers prefixed to the names of species are those employed in the Bird volumes in the "Fauna of India" series.

4. Corvus macrorhynchus, Wagl. Oates, I, p. 17; "Str. Feath.," II, p. 243.

Very numerous in the Andamans; it has apparently disappeared from the deserted settlement at Camorta in the Nicobars, where it was introduced from Port Blair.

Corvus splendens was introduced in Colonel Tytler's time, but gradually entirely disappeared.

20. Dendrocitta bayleyi, Tytler. Oates, I, p. 34; "Str. Feath.," II, p. 245.

Fairly common in the jungles in the neighbourhood of Port Blair. The habits are those of the genus. The bird has a harsh call-note constantly repeated when a party is broken up by being fired at. It seems rather an inquisitive bird. I have often, when standing still in thick jungle, noticed it hopping about in the branches overhead peering down to try and make me out. On one occasion I noticed a party of three on a bare tree rising from thick jungle, drying their plumage after a heavy shower. On my reaching the tree I fired at one and missed, the birds flying off in different directions. In a couple of minutes one came back to look for the others, which I shot; a minute later the other two returned to the tree and I shot another.

It breeds apparently in April and May, as young birds were common in June. These differ from the adult in having the black of the head duller, the brown of the back less rufescent, the reddish-brown of the under parts duller, and the chest browner. The young bird seems to start in life with an olive-green iris, changing in a short time to bright green. An inner circle of golden yellow then appears and gradually encroaches on the green, until the beautiful clear yellow eye of the adult bird is attained. These changes were very conspicuous in young birds shot in June and July.

226. Zosterops palpebrosa, Temm. Oates, I, p.213; "Str. Feath.," II, p.224.

The Andaman and Nicobar White-eyes differ only from continental birds in having a larger bill. They are, as Davison remarks, commoner in the Nicobars than in the Andamans, but in neither group are they as numerous as I have seen them elsewhere. Breeds in the earlier months of the year. Davison found young birds in February.

254. Irena puella, Lath. Oates, I, p. 240; "Str. Feath.," II., p. 226.

Occurs in both groups. At Port Blair it is certainly much more numerous in the N.-E. monsoon than at other seasons. When I arrived in May hardly a bird was to be seen; I came across a few in June and July, and on my return from the Nicobars in September found them numerous everywhere, adult males, however, being hardly one in twenty. Davison says the young are about in April. Two old males which I shot on June 9th were obviously breeding.

This lovely bird is by no means so conspicuous as one would imagine. Indeed, in shady forest the male generally looks as black as a drongo, only now and again showing its satin-blue back as it flutters across some sunlit piece of open jungle. It is a tame bird, allowing a very close approach, and feeding quietly upon berries regardless of an observer. The old males are somewhat shier, though far from wild. I usually met with it in small parties of five or six to twenty or thirty, often without a single old cock bird among them.

288. OTOCOMPSA EMERIA, Linn. Oates, I., p. 276 ; "Str. Feath.," II., p. 225.

The Red-Whiskered Bulbul is extremely plentiful in the Andamans, where it is one of the commonest birds. Davison mentions meeting with it at Camorta and Car Nicobar, where it had just been indroduced, but I saw nothing of it at either of these localities, from which it may have since disappeared. I found a nest or two in June.

297. IOLE NICOBARIENSIS, Moore. Oates, I., p. 285 ; "Str. Feath," II, p. 223.

A forest bulbul, peculiar to the Nicobars. It has been recorded from the islands of Teressa, Bompoka, Tillangchong, Camorta, Nancowry, Trinkut, Katchall and Pilu Milu. Mr. Hume says that he did not observe it on Great or Car Nicobar. Occurring as it does on Pilu Milu, it is pretty sure to extend to both the Little and Great Nicobars, but from Car Nicobar, lying by itself to the north of the other groups, it is certainly absent.

312. MICROPUS FUSCIFLAVESCENS, Hume. Oates, I, p. 295 ; "Str. Feath.," I, p. 297, and II, p. 224.

This species has only apparently been obtained on the South Andaman, where Mr. Oates says "it appears to be abundant." It appeared to me very far from being so; indeed, I do not think I saw the bird more than a dozen times during a stay of eight months. Davison's experience seems to have been similar ; he only collected eight specimens in six months, and remarks that it is "comparatively rare." It is a quiet, unobtrusive little bird, keeping to thick jungle, and is almost always in pairs.

326. DICRURUS ANNECTENS, Hodgs. Oates, I, p. 312; "Str. Feath.," II, p. 209.

Mr. Hume says that Blyth received a specimen caught at sea by Captain Lewis when nearing the Nicobars. Mr. Oates gives no later record of its occurrence in either group.

332. DICRURUS LEUCOGENYS, Wald. Oates, I, p. 317 ; "Str. Feath.," II, p. 210.

Is, like the last, only a straggler to the islands. Captain Wimberley sent Mr. Hume a specimen procured on November 5th, 1873.

336. DISSEMUROIDES ANDAMANENSIS, Tytler. Oates, I, p. 321 ; "Str. Feath.," II, p. 211.

The small Andamanese Drongo is very common in the Andamans. Mr. Oates says :" Habits, apparently, the same as those of *D. ater*." It is much more of a forest bird than *D. ater*, being seldom met with outside the jungles. It is highly gregarious, flocks of half a dozen to twenty travelling through the forest together in search of food, either by themselves or in company with *Irena puella, Sturnia andamanensis, Graucalus dobsoni, Pericrocotus andamanensis*, etc.

337. DISSEMUROIDES DICRURIFORMIS, Hume. Oates, I, p. 322 ; "Str. Feath.," II, p. 211.

Occurs only on the Great Coco and Table Island, where it is numerous. I did not visit the Cocos and know nothing of the bird myself. Its habits are said to be those of the *Dicruri*.

340. DISSEMURUS PARADISEUS, Linn. Oates, I, p. 325 ; "Str. Feath.," II, p. 212.

The Large Racket-tailed Drongo is fairly common in both groups, and its sharp lively call of five notes is constantly heard in the jungles. Sometimes in the evening they rise above the tree tops to capture termites and other insects, following them to some elevation, and their flight is then graceful in the extreme.

360. LOCUSTELLA CERTHIOLA, Pall. Oates, I, p. 352 ; "Str. Feath.," II., p. 235.

Pallas's Grasshopper Warbler is a winter visitor to the Andamans, apparently scarce, though from its skulking habits doubtless often overlooked. I only saw it once, when it rose from some grass right under my feet. I failed to flush it again, but am certain of its identity, as I could see the white on the tail which distinguishes it from the next species.

361. LOCUSTELLA LANCEOLATA, Temm. Oates, I, p. 353 ; "Str. Feath.," I, p. 409.

This Locustelle is fairly common in the Andamans in winter. Between November and January I flushed it constantly in paddy fields, high grass, &c. It is hard to flush—very hard to put up a second time, and probably for every one seen a dozen are passed over. I found it very hard to procure specimens without knocking them to pieces. Its jerky flights are so short that one has to fire at it at under twenty yards or it drops into the grass again. It is extremely annoying after missing a dodgy little bird like this once or twice through giving it too much law to see a perfect cloud of feathers drift away after a shot, and to know before picking your little victim up that it will be utterly useless as a specimen and has been destroyed to no end.

381. CISTICOLA CURSITANS, Frankl. Oates, I, p. 374 ; "Str. Feath.," II, p. 235.

This little Grass-Warbler is extremely numerous on the open grass-covered plains and hills that are a feature of the Nicobar Islands ; I am not aware that it has been obtained in the Andamans, where the only open hills are covered with short spear-grass, and not the rank coarse growth in which this bird delights.

393. ARUNDINAX AEDON, Pall. Oates, I., p. 390; "Str. Feath.," II, p. 234.

The Thick-billed Warbler is a common winter migrant to the Andamans ; in the Nicobars it appears to be somewhat scarcer. When approached it usually utters a loud "click-click-click," which Davison aptly likens to the cocking and uncocking of an old musket lock. It is found in any sort of cover, but is particularly partial to a kind of herbage which grows to a height of two or three feet in and around ponds of standing water. In this thick cover it works its way about like a reed warbler, hopping from stem to stem low down near the water, its presence being only apparent from the jerking movement of the herbage and its incessant clicking note. On the wing between one patch of cover and another when disturbed, owing to a certain similarity in size and colour, it is not unlike one of the small Shrikes, *Lanius lucionensis* or *L. cristatus*.

410. PHYLLOSCOPUS FUSCATUS, Blyth. Oates, I, p. 405; "Str. Feath.," II, p. 236.

A winter visitant to the Andamans; scarce.

424. ACANTHOPNEUSTE MAGNIROSTRIS, Blyth. Oates, I, p. 415; "Str. Feath.," II, p. 236.

Mr. Hume procured a single specimen at Mount Harriet in the Andamans.

426. ACANTHOPNEUSTE LUGUBRIS, Blyth. Oates, I, p. 417; "Str. Feath.," II, p. 236.

Not uncommon in the Andamans in winter, but very far from being numerous.

451. HORORNIS PALLIDIPES, Blanf. Oates, I, p. 437.

I procured a single specimen of this tiny Bush Warbler on June 26th, in dense undergrowth in jungle on the very summit of Mount Harriet. Unfortunately I had no choice but to shoot it at very short range with a 12 bore and No. 8 shot, the result being that it was terribly knocked about, a portion of the breast being shot away altogether. However, the head wings, tail, and legs are perfect and the back view of the specimen is all right. Its action and a low rattling note reminded me rather of *Rhopocicha*. Length, $4\frac{9}{16}''$, wing $1\frac{15}{16}''$, tail $1\frac{5}{16}''$, tarsus $\frac{3}{4}''$, bill at gape $\frac{9}{16}''$. Bill brown, basal half of lower mandible and gape yellow. Legs and claws pallid whitish-fleshy.

481. LANIUS CRISTATUS, Linn. Oates, I, p. 468; "Str. Feath.," II, p. 198.

Occurs in the Andamans in most months of the year, its numbers being augmented by an influx of young birds in the summer. At no time is it nearly as numerous as the next species, which is *the* Shrike of the Andamans, and seldom out of sight in the cold weather.

482. LANIUS LUCIONENSIS, Linn. Oates, I, p. 469; "Str. Feath.," II, p. 199.

The Philippine Shrike is extremely common in the Andamans in the cold season. Mr. Oates says it appears to be a permanent resident, as the Hume collection contains specimens killed in these islands in almost every month of the year. The bulk of the birds certainly are *not* residents; personally I never saw it at all until September, after which one might have shot any number. I do not think that the stragglers left in the hot weather breed in the islands. It is curious how many of the winter migrants to the Andamans leave a certain percentage of their number to remain throughout the year.

This shrike is also found in the Nicobars, but is less numerous there than in the Andaman group.

492. PERICROCOTUS ANDAMANENSIS, Tytler. Oates, I., p. 481; "Str. Feath.," II, p. 208.

Common in the Andamans, to which it is confined. Habits the same as those of *P. speciosus*, of which it is little more than an insular race.

500. PERICROCOTUS PEREGRINUS, Linn. Oates, I, p. 487; "Str. Feath.," II, p. 209.

The Little Minivet is common in the Andamans but does not extend to the Nicobars. Parties of this bird are extremely regular in their habits, working their way to their roosting place along the same line of trees night after night. This Minivet is sociable to a degree; I have several times known a whole party to flutter down after a shot bird (dead or living) and for several seconds remain by it on the ground, moving with very short hops. Their concern, however, seems short-lived, and in a minute they are playing their usual game of follow-my-leader among the trees as gaily and light-heartedly as if nothing had happened. These are the only occasions on which I have ever seen a *Pericrocotus* of any sort on the ground.

I think May to July is the breeding season in the Andamans. On the 15th of the latter month I watched a pair building for some time. The hen bird was doing all the work, but the male never went a yard from her side, accompanying her on every journey to and from the nest, and watching her lovingly and admiringly as she added each tiny piece of material. I left them to the enjoyment of love's young dream and they eventually reared two young safely.

503. PERICROCOTUS CINEREUS, Lafr. Oates, I, p. 489.

I killed a single specimen, an adult male, near Port Blair on the 19th November. It was associating with a party of *P. andamanensis* to which it had attached itself. From its entirely grey back and whitish breast I recognized it at a glance before I shot it.

Mr. Oates says he procured one near the town of Pegu in February, and that it has not been recorded from any other part of the Empire. Unfortunately the specimen I obtained was so disfigured by shot—the whole bill being blown away—that I did not preserve it, but as to its identity I have not the slightest doubt, having since had an opportunity of examining several examples of the species.

509. CAMPOPHAGA TERAT, Bodd. Oates, I, p. 495; "Str. Feath.," II, p. 202.

The Pied Cuckoo Shrike was obtained by Davison at Camorta in the Central group of the Nicobar Islands; it probably occurs also on the Little and Great Nicobars, as a single specimen was obtained at Acheen. It does not occur on Car Nicobar. I did not come across this bird at all. Davison found it not uncommon at Camorta ; from his account it appears to be a rather tame bird, associating in small parties and feeding in thick undergrowth near the ground. In the Malay Peninsula I have generally found it singly or in pairs.

510. GRAUCALUS MACII, Less. Oates, I, p. 496; "Str. Feath.," II., p. 204.

The Large Cuckoo Shrike is a very common species in the neighbourhood of Port Blair, where clearing and cultivation have made the country open enough for its liking. Unlike the next species it is not found in thick forest, keeping to gardens, clearings, or trees standing in the open.

511. GRAUCALUS DOBSONI, Ball. Oates, I, p., 497 ; "Str. Feath.," II, p. 206.

This species is common enough in forest, out of which it is never met with. It is a quiet bird without the noisy whistling cry of *G. macii*, associating with the Mynas, Minivets, Drongos, etc., which roam through the Andaman jungles in company. It has a rather pleasing, though short, song.

513. ARTAMUS LEUCOGASTER, Val. Oates, I, p. 499; "Str. Feath.," II, p. 214.

The White-rumped Swallow Shrike is very common in the Andamans, especially so in the opened and cultivated country round Port Blair. It is a charmingly fearless little bird, often allowing one to watch it from as short a distance as six feet. It is sociable in the extreme, a party frequently settling on a bare branch or other suitable perch and nestling closer and closer to each other until they form a regular feathery ball. Any one who cared to shoot at them then might kill a dozen at a shot. A pair alone nearly always sit touching each other, and should one dart off after a passing insect its companion utters a rather harsh little chirp of encouragement ; with a few rapid wing-strokes and a graceful skimming swoop the prey is captured and the pursuer settles at the side of his mate again. They seem to have a great affection for each other, and if one is shot its companion circles backwards and forwards round the head of the slayer in the most obvious distress. Davison remarks that it is an exceedingly easy bird to shoot on the wing, its flight, though very graceful, being slow and steady ; so much is this the case that I have frequently killed it flying with a catapult.

This *Artamus* settles freely on the ground, on which it moves with very short hops. I have noticed it following a plough, and alighting among the newly turned clods of earth in search of the insects exposed. I have also noticed it perching on roofs of buildings and bungalows, which I do not recollect having seen *Artamus fuscus* do. *A. leucogaster* is by far the more familiar bird of the two.

Very little is known of its nidification. Davison found a nest in May in which the bird had not then laid. It was placed about twenty feet from the ground in a rotten mangrove stump. April and May are certainly the principal breeding months. I found no end of newly fledged young sitting about the trees in May, but a careful search only resulted in my finding one nest. This was placed on the bracket formed by a parasitic " oak-leaf " fern (*Polypodium quercifolium*) which was growing against the stem of a jak-tree some fifteen feet from the ground. The nest was composed almost entirely of dry grass, and contained one young one large enough to fly when my fingers touched it as I felt for eggs. I fancy these birds breed in fairly close company where there are suitable trees, as I saw several very young birds in one clump of jak-trees where they were probably hatched.

516. ORIOLUS MACRURUS, Blyth. Oates, I, p. 503; "Str. Feath.," II, p. 228.

The Nicobar Oriole is extremely abundant throughout the islands of that group. Its habits in no way differ from those of its congeners. Its note is a long drawn modulated whistle, sounding like " pee-u."

Car Nicobarese name—" machéon."

517. ORIOLUS ANDAMANENSIS, Tytler. Oates, I, p. 504; " Str. Feath.," II, p. 226.

Extremely common throughout the Andamans. I believe the nest has not been described; I found two, the first, found on May 19th, situated about eight feet from the ground in a small rain-tree (*Pithecolobium sp.* ?) by the roadside, was a very small and slight nest of the usual Oriole type, and contained one large young one only. The other nest, taken on June 1st, was some fifteen feet from the ground in a *Hibiscus* of sorts standing some forty yards from the jungle edge, and contained three hard-set eggs. This nest was much larger and more solid than the first, almost double the size; it was lined with fine roots and fibres, under which was a layer of strips of dead plantain leaf (one of these pieces as large as 6 ins. by 2 ins.); then came the foundation of dead and skeleton leaves held together and suspended to the fork of the branch by fibres of the cocoanut palm.

Eggs.—Ground-colour white with a strong pinkish-brown tinge, spotted at the large end with madder-brown, with a few underlying purplish-grey spots. Some of the larger spots have a pinkish-brown nimbus round them, giving them the appearance of having been put on a wet surface and having " run."

521. ORIOLUS MELANOCEPHALUS, Linn. Oates, I, p. 506; " Str. Feath.," II, p. 230.

Davison seemed to think the Black-headed Oriole only a migrant to the islands, as he did not meet with it at all until April, after which it was not uncommon. My experience was exactly the same; I shot two in May, and saw several between May and July, after which I neither saw nor heard it. Mr. Hume, however, doubts its being only a seasonal visitant, and as Mr. Oates remarks that it is " everywhere a resident in well wooded parts," it is probably a permanent resident in the Andamans, though for some reason undoubtedly more in evidence in the summer months. Not recorded from the Nicobars.

524. EULABES INTERMEDIA, Hay. Oates, I, p. 511 ; "Str. Feath.," II, p. 254.

This Grackle is extremely common in both groups. Mr. Oates says that typical Andaman and Nicobar birds have a longer wing and a larger white wing patch than true *E. intermedia*, but he does not recognize *E. andamanensis* as a species.

527. CALORNIS CHALYBETUS, Horsf. Oates, I, p. 514 ; "Str. Feath.," II, p. 253.

The Glossy Tree-Stare is very numerous in both groups, especially in the Nicobars. According to Mr. Oates, the Andaman race of this bird is, "in addition to being somewhat larger, of a much darker green, almost a black in some lights."

These starlings appear to grip the bough on which they are seated very tightly. On one occasion I fired up into a flock which were feeding among the foliage of a huge *Ficus* high over my head. The flock left the tree with a whirr of wings, and somewhat to my surprise nothing fell ; then after quite half a minute's interval, and with several seconds between each, four birds fell one after another at my feet.

I once saw half a dozen feeding on the ground below a *Ficus* on the berries which the remainder of the flock were dropping from above.

Car Nicobarese name—"tukkuliv."

528. PASTOR ROSEUS, Linn. Oates, I, p. 518 ; "Str. Feath.," II, p. 252.

At most only a rare accidental visitant to the Andamans, where it has not, apparently been procured, its claim to a place on our list resting only on Colonel Tytler's statement that several arrive in flocks in January Mr. Hume says that Colonel Tytler knew the bird well and was not likely to have been mistaken.

540. STURNIA ANDAMANENSIS, Tytler. Oates, I, p. 529 ; "Str. Feath.," II, p. 248.

This Myna is one of the commonest birds in the Andamans, where it literally swarms when attracted by any extra abundance of food supply. It feeds a great deal on the ground in paddy fields, on open grass-land, &c., and also frequents heavy forest, flocks travelling in search of fruits and insects in company with *Dissemuroides andamanensis, Graucalus dobsoni*, and *Pericrocotus andamanensis.* It is particularly partial to a small caterpillar which rolls itself up in the narrow leaves of the bamboo, and flocks may be seen hanging in all sorts of tit-like attitudes diligently opening every rolled up leaf they can detect, with varying results, the little shelter not being always tenanted.

I believe both this and the next species differ from the genus *Sturnia* in having the young not brown but very similar to the adults (see remarks on next species). Mr. Hume says that his party preserved nearly fifty *old and young*, and shot altogether nearly a hundred. He then proceeds to give a very careful description of the adult, but says nothing whatever about any brown young birds. His collection was made too in the earlier part of the year when these would be about.

541. STURNIA ERYTHROPYGIA, Blyth. Oates, I, p. 529; "Str. Feath." II, p. 248.

This species was described by Blyth in 1846; in 1873 Mr. Hume's party obtained a specimen, now in the British Museum, on Car Nicobar island. Mr. Oates says that no other specimen has been procured by any naturalist since.

The fact is that this extremely little-known Myna is peculiar to the one island of Car Nicobar, which lies by itself to the north of the other groups, and on this island it is quite a common bird. I brought away 27 skins, some very good and some indifferent specimens. In action, habits, notes, etc., it exactly resembles the common *S. andamanensis*, except that it is, from the nature of the island it inhabits, *entirely arboreal*, while *S. andamanensis* feeds as much on the ground as *Acridotheres tristis*. There is not a yard of open grass on Car Nicobar, except the savannahs covered with rank grass three feet in height, so that a Myna cannot possibly find the smallest piece of *turf* to walk on. The Nicobar Myna feeds almost entirely on berries and fruits, though I once or twice saw it capture an insect on the wing. During the day these Mynas disperse in pairs and small parties to feed, collecting in large flocks in the evening to return to roost. These large flocks, often of three or four hundred birds, invariably used to pitch on some tall and gnarled old *Casuarina* trees, growing at the edge of a low cliff beneath which the surf was breaking in great sheets of white spray. Many of the birds shot on these trees dropped into the sea and were lost.

I am inclined to think they breed chiefly at the beginning of the year, probably from February to May. I saw a pair frequenting a hole in a *pandanus* which contained an old nest, composed of pieces of grass and cocoanut fibre. They must breed chiefly in holes in the *pandanus* and *Casuarina* trees.

The chesnut on the plumage of this bird shows very conspicuously in flight, and it could be distingnished from *S. andamanensis*, did the two occur in the same locality, at a considerable distance.

It is rather a shy bird, and flocks after being once or twice fired at become very wary indeed.

The following description is from my series of twenty-seven birds :—

Adult (nine males and five females).—Entire head, neck, breast and abdomen cream-colour, with a pale yellowish tinge, most pronounced on crown and neck, this cream-colour becoming pure white on the upper back; middle back and scapulars smoke-grey or brownish-grey. (In four males out of nine the scapulars are distinctly tinged with chesnut, and have chesnut shaft stripes.) Rump and upper tail coverts bright chesnut. Wings black, strongly glossed with rifle green; tail black with a green gloss, the central pair of feathers very narrowly tipped with chesnut, the tips becoming successively broader on each pair of feathers until, in the outer pair, nearly the whole of the outer and about an inch of the inner web is chesnut. Lower abdomen from a little above the vent and lower tail coverts deep chesnut, with which the flanks also are more or less suffused. Wing-lining white, generally mingled with a few black and chesnut feathers.

Four adult females out of five differ distinctly from the males in having the chesnut of the vent shading up into the white of the abdomen, so as to tinge the whole of it with creamy-chesnut or fawn-colour (in one right up to the shoulders). None of the females have any chesnut on the scapulars.

Soft parts.—Bill, lemon-yellow, with upper mandible behind nostril and base of lower mandible smalt-blue; *feet*, dirty lemon-yellow. *Iris*, opalescent white to pale Cambridge-blue; *inside of mouth* smalt-blue; in apparently a very old bird, blackish-blue.

Young birds (eight males and five females).—Mr. Oates, says ("Birds," I, p. 525): "In *Sturnia* the young are brown till the first autumn." I can hardly believe that this is correct with regard to these two species. In the Andamans and Nicobars, from May to March, I saw certainly two or three thousand of *S. erythropygia* and *tens of thousands* of *S. andamanensis*, and in no case did I ever see a bird with any traces of brown, although I killed one *S. andamanensis* with the gape still soft and yellow and the old birds feeding it.

The young of *Sturnia erythropygia* differ only from adults in having the feathers of the crown with narrow brownish-grey shaft-stripes (very faint in some); the upper wing coverts, secondaries, and tertiaries narrowly edged with fulvous, except the innermost tertiary feather which is broadly edged with grey; and the abdomen more tinged with creamy-fawn than in adults. Sexes alike, except that the oldest immature female (which has dropped all rufous edgings to the feathers and only differs from an adult in retaining the pink at the base of the bill) has the abdomen more strongly tinged with chesnut than any male.

I am of opinion that the young leave the nest in the plumage above described, and are never brown.

The immature bird has the *iris* pale grey; *bill* yellow, inclined to dull greenish above; base of the lower mandible (blue in adults) fleshy-pink or rosy-pink; *legs* and *feet* yellow, claws dusky yellow. *Inside of mouth* fleshy pink. Both sexes are similar in size, though varying *inter se* ; as the bird is so little known I give the measurements of a dozen examples:—

	♂ ad.	♀ ad.	♂ ad.	♀ ad.	♂ ad.	♂ ad.	♂ ad.	♀ ad.	♂ j.	♀ j.	♀ j.	♂ j.
Length	$8\frac{7}{8}$	9	9	$8\frac{3}{4}$	$8\frac{3}{4}$	$8\frac{7}{8}$	$9\frac{1}{8}$	$9\frac{1}{8}$	$8\frac{3}{4}$	9	$8\frac{3}{4}$	$8\frac{1}{2}$
Wing	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{7}{16}$	$4\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{1}{2}$	$4\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{3}{8}$	$4\frac{1}{4}$
Tail	$2\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$2\frac{15}{16}$	$2\frac{3}{4}$	$3\frac{3}{16}$	$2\frac{11}{16}$	$2\frac{7}{8}$
Tarsus	$\frac{15}{16}$	1	$1\frac{1}{16}$	1	1	$1\frac{1}{16}$	$1\frac{1}{16}$	1	1	1	1	1
Bill at G. ...	$1\frac{3}{16}$	$1\frac{3}{16}$	$1\frac{5}{32}$	$1\frac{1}{8}$	$1\frac{3}{16}$	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{3}{16}$	$1\frac{5}{32}$	$1\frac{3}{16}$	$1\frac{1}{8}$
Bill at F. ...	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$

Mr. Blyth's type specimen is still in the Calcutta Museum, where I lately examined it.

Car Nicobarese name—" halué " or " haroitch."

542. AGROPSAR STURNINUS, Pall. Oates, I, p. 530 ; " Str. Feath.," II, p. 249.

The Daurian Myna occurs in the Nicobars ; Mr. Davison met with a flock of seventy or eighty together at Camorta. I did not come across it ; I do not think it can be common in the Nicobars, to which it is only a winter migrant.

549. ACRIDOTHERES TRISTIS, Linn. Oates, I, p. 537 ; " Str. Feath.," II., p. 246.

Mr. Hume writing in 1873 says that this species, introduced by Col. Tytler, though exceedingly numerous on Ross Island, had not then extended to the main land.

It is now one of the commonest birds at Port Blair, being very abundant wherever there is cultivation, and roosting in hundreds in the clumps of bamboos with which the Settlement roads are shaded. I also saw a few frequenting the old guard house at the abandoned settlement at Camorta in the Nicobars, where they were introduced from Port Blair.

582. MUSCITREA GRISOLA, Blyth. Oates, II, p. 31 ; " Str. Feath.," II, p. 201.

Occurs on the Andamans and Cocos. It appears to be rare ; Mr. Hume's party only obtained four specimens, and I only saw the bird once, oddly enough the first morning I was at Port Blair. It was hopping about in some mangroves near the sea ; I watched it closely for some minutes, but having other specimens to skin, and naturally concluding that a bird I met with on my first morning I should be sure to see again, I did not shoot it—an unfortunate mistake, as I did not have another chance of securing an example.

587. Anthipes sp. ? (olivaceus ?), Hume. Oates, II, p. 34.

I can only make a guess at the identity of a flycatcher I met with near Port Blair during the first week in October. It flew out of a clump of bamboos overhanging a stream, captured an insect, and returned to its perch. My attention being attracted by its reddish-brown tail and rump, I crept close up to it and had a good view of it sitting not more than ten feet off. In colour it was brown above, the rump and tail conspicuously reddish when it was on the wing; below pale buff or whitish. In size it was similar to, or perhaps a trifle larger than, *A. latirostris.* I had only a 12 bore gun with me at the time, and, the bird being so tame, I thought I could knock it over with a catapult I had in my pocket, and with this rather uncertain weapon I managed to miss it. The next day I went after it with a ·410 bore gun, but though I saw the bird again it darted off among the bamboos and dodged me somehow, nor could I find it a third time. Looking through the flycatchers in Mr. Oates's work it struck me this *might* have been the above species, which he says occurs in Tenasserim, Java and Borneo. At any rate one species of flycatcher must be added to those already known to occur in the group.

588. Alseonax latirostris, Raffl. Oates, II, p. 35; "Str. Feath.," II, p. 219.

A fairly common winter migrant to the Andamans.

600. Terpsiphone nicobarica, Oates. Oates, II, p. 48; "Str. Feath.," II, p. 216.

This form of Paradise Flycatcher occurs in both groups. Davison says it is "exceedingly rare at both the Andamans and Nicobars." At the Andamans it is certainly rare—I only saw it twice in eight months—but on the Nicobars young birds seemed to me fairly numerous. I did not see a single specimen in the white plumage of the adult male.

601. Hypothymis azurea, Bodd. Oates, II, p. 49; "Str. Feath.," II, p. 217.

The Azure Flycatcher is exceedingly common on the Nicobars, but in the Andamans is replaced by the next species. Mr. Oates says he has not seen a nestling; noting this, I tried to get one on Car Nicobar during my stay there, where the bird was very plentiful. I failed to get a very young bird, but from the number of birds in female plumage, I suspect the nestling much resembles the adult female.

Mr. Oates is quite correct in considering that the alleged difference between *H. azurea* and *H. ceylonensis* does not hold good. I have seen and shot numbers of the Ceylon bird, and in adult males the black-throat bar is, I think, always present.

Car Nicobarese name—"Kalong tésa."

602. Hypothymis tytleri, Beavan. Oates, II, p. 50; "Str. Feath.," II, p. 217.

This species—or race ?—replaces *H. azurea* in the Andamans, where, however, it is much scarcer than that bird is in the Nicobars. Mr. Hume got forty-two specimens : it would take a long time to get as big a series near Port Blair. I don't think I *saw* half as many all told. I only shot three, and only preserved *one*, so am rather chary of making any remarks on the bird. *All three* of mine, however, had *some* white on the lower surface. Mr. Hume says: "The typical adult *H. tytleri* has not a particle of white about the abdomen, vent, and lower tail coverts"; and Mr. Oates in his key to the species says : " Abdomen, vent and under tail coverts white=*H. azurea* ; abdomen, vent and under tail coverts blue=*H. tytleri.*" Mr. Hume says, however, that a Teressa bird (*H. azurea*) could not be separated as regards coloration from one of the least typical *H. tytleri.* Mr. Oates says : " Such birds are not often met with, and do not, in my opinion, affect the question." It seems to me that adult males of *H. tytleri* with some white on the lower parts cannot be uncommon, and I cannot see why these do not affect the question.

My three birds were :

(1) ♂ adult (breeding).—Lower abdomen and vent white, under tail coverts greyish-blue.

(2) ♂ adult (breeding—nest taken).—Centre of abdomen white, vent and lower tail coverts dull whitish-blue.

(3) ♂—apparently adult. Similar to last.

Certainly none of these had anything like the amount of white on the lower surface that a typical *H. azurea* has, but a beginner in ornithology—myself, for instance—would have been puzzled, not knowing the locality from which the birds came, to identify No. 1 by Mr. Oates' key.

A nest and three eggs I took were exactly similar to those of *H. azurea.*

610. Pratincola maura, Pall. Oates, II, p. 61 ; " Str. Feath.," II, p. 233.

Only a rare winter visitant to the Andamans.

647. Cyanecula suecica, Linn. Oates, II, p. 99 ; " Str. Feath.," II, p. 234.

A scarce winter visitant to the Andamans. Mr. Oates considers it probably also reaches the Nicobars.

663. Copsychus saularis, Linn. Oates, II, p. 116; "Str. Feath.," II, p. 230.

An extremely common bird near the Settlement in the Andamans, probably absent from the wilder parts of the islands, and not extending to the Nicobars.

I found numerous nests in the early part of the year.

665. Cittocincla albiventris, Blyth. Oates, II, p. 120 ; " Str. Feath.," p. 232.

This Shama is common throughout the dense jungle of the Andamans ; its habits are much the same as those of *C. macrura*, excepting that it keeps lower down in the dense cover it frequents ; even when singing it seldom perches more than five or six feet from the ground. It is a shy bird, and, in thick jungle, very difficult to shoot, flitting off at the least crack of a stick.

It is very lively at dusk, and is late in going to roost, after which it constantly utters a long-drawn note like "chee-ee" from the bush in which it has taken up its quarters for the night before finally settling down to sleep. I never heard it utter this note in the day.

Mr. Hume says this bird "Has no voice, no ear, and not the faintest conception of singing." This seems to me a most undeserved libel on our little Andaman Shama; it certainly has a large and varied *repertoire* of harsh notes and most unmusical cat-calls, but it can and does sing well, its song being very like that of the Indian bird, though never so sustained and not so varied. It sings mostly during the first half of the year--the breeding season. I found a nest in June, from which the young had apparently just flown; it was in a crevice in a rotten stump in thick jungle, composed of grass and dead bamboo leaves, and very like a nest of *Copsychus saularis.* I have known one of these Shamas enter a house; but this was quite unusual, it being strictly a forest bird and seldom venturing into the open.

(*To be continued.*)

FISHING IN INDIAN WATERS.

PART II.

THE MULLET AND GARFISH.

BY FRED. O. GADSDEN, R. I. M.

In a former article (p. 194 *ante*) I have spoken of the bahmin or Indian salmon as standing pre-eminently forward as *the* sporting fish that we get out here; but it is not to be inferred from this that we really have no other. As the bahmin has been compared, and in my opinion justly so, to the salmon, so the fishes mentioned above may be likened in many ways to a fish which has always been a great favourite with all who follow the gentle art, *viz.*, the grayling. This may appear a very far-fetched idea, but any one who knows them both will, I am sure, agree with me in this matter.

THE MULLET (*Mugil œur. Mugil cœruleus maculatus*).—In appearance he is not really unlike the grayling—in fact, he is as like as it is possible for two fish of absolutely different species and inhabiting different waters to be. In their niggling, fiddling way of feeding they greatly resemble each other, and when once hooked, in their manner of playing or, perhaps, one should say of fighting for their lives, there is a strong resemblance.

I cannot quite remember now where I once saw the remark that if the trout was a gentleman and lord of the stream, the grayling was as certainly a lady and queen of fresh-waters; but no one can fish often for mullet and catch them, without feeling, involuntarily, what a really nice lady-like, well-behaved fish he is, and any one acquainted with dear old Izaak Walton must recall to mind what he says about this fish: "And therefore, I pray you, harken what Du Bartas says of the mullet:—

> "But for chaste love the mullet hath no peer;
> For if the fisher hath surprised her pheer,
> As mad with wo to shore she followeth,
> Prest to consort him both in life and death."

Such constancy as this is more often an attribute of the female than of the male, I fear.

I do not know that we have any really fresh-water mullet in English waters, though there are several fresh-water species out here; so I presume that our old friend was referring to the sea mullet. And I have often noticed myself, when a fish has been hooked, and is being slowly drawn in, that it is very often accompanied by its companions, and not seldom you may catch nearly the whole school before those that are left will leave. I know this, that I have never caught mullet without having forcibly brought back to me the memory of many, many happy days spent on the banks of the Wye, the Lugg, and the Munnow after grayling; and often during the heat of a really hot Aden day for instance (mullet bite best in the midday without a breath of wind), have I thought of the pleasant days spent at home when the country was looking simply gorgeous with the meridian splendour of its autumnal hues, and when to loaf along the river banks, to drink in the fresh and creamy air, to enjoy the scenery, listen to the song of the birds, to experience the life blood racing through your veins—in short, to feel young and fit, and strong, was to live indeed. Such feelings come back upon me very often when growing old out here in exile, and one yearns for the time that has gone, for the days that will not return.

But to return to our friends the mullet, I know that at home he is considered difficult to catch, and is always looked upon as a very shy and a very wary fish. That very wariness seems to be a part and parcel of his very nature, for even out here, where he is not often troubled by the flash of the green heart wand, he is still almost, if not quite, the most difficult fish to get on even terms with. I have every reason to suppose that he enjoys a variety in his diet, and yet after many years I have come to the conclusion that there is but one bait which is worth trying, and to which he will generally succumb—a very simple bait, and one easily obtained and as easily applied, *viz.*, the light-brown crust of a loaf of bread.

There are, I believe, some six-and-twenty species of *Mugilidæ* in Indian waters, but many of these are fresh water species, and some are naturally pigmies, and never attain very considerable size ; but in some places, and notably in Aden and in the Andaman Islands, there are some really fine, portly, aldermanicspecimens of the species noted above, and, granted you can drop across them, they are well worth the trouble of catching. In Aden the mullet is fairly common and grows up to a length of about 3 ft., and weighs anything from 1lb. to 5lbs. and even 7lbs. and 8lbs.; I have never been able to get one over 3½lbs. though. In Port Blair several species are represented, but there is one that is especially handsome. This fish, when first caught, has a lovely blue sheen on the back and shoulders, and though never so large as the Aden lot, running up to about 15ins. in length, is a particularly delicate fish for the table. The *modus operandi* of catching them is delightfully simple. Send some one down to the pier or rocks, and if they see the fish about, well and good. If not, then you must try and induce them to show up. To do so, get your loaf of bread, and having bored a hole through it, make fast a good long line to it (linen thread is the best), and heave it out as far as possible—30 yds. or 40 yds. or further if you can—and then wait a while. With any luck, in a short time you will see the loaf agitated and you will hear a sort of " suck suck " noise. Your friends are there, and they are quietly and quickly chewing away at the undercrust.

Now comes in the delicacy of the operation, for you have to try and induce them to come within your reach, without frightening or disturbing them. Little by little—in fact, inch by inch—you gather in your thread and you will find, if you are not in too great a hurry, that you will eventually get them to within an easy casting distance of where you are. You will, of course, be ready, rigged up with a very long and a light trace made of the finest gut, certainly not less than 4 yds. long, armed with a small crystal hook, baited with a piece of this self-same light brown crust, and supported by very small pieces of cork fastened at intervals up the trace to prevent it sinking. When you find them well within your reach, cast lightly and carefully close to the loaf and then ten to one if you have made a good clean cast, you will get your reward. The mullet, as I have remarked, is a " niggly" feeder, and many times you will see your bait apparently in his mouth, and yet when you come to taughten up he will quietly let go and you will find that all this time he has simply been " pulling your leg." But there comes a time when you have the " bulge" on your side. He may, perhaps, have closed his lips a little harder than usual upon the crumb, and the hook has responded to your gentle twitch, the barb has gone home, and you find yourself making the acquaintance of your finny friend.

I have not specifically mentioned, but I take it for granted that my readers have understood that this game can only be played with the finest tackle-rod, reel, line, cast and hook all on a par ; and when once hooked you can easily understand how delicate must be the manipulation if you and your friend are not to part company. For this game I nearly always use a light single-handed trout rod, made for me by F. M. Walbran of Leeds of the pattern known as the " Bickerdyke." It has a long and a short butt, and is a beautifully handy little rod and just the very thing. Reel to suit the rod. Line, an H sized American dressed taper line, 60 yds. Trace of ordinary fine gut, and the hook—well, generally a round bend, size from 16-20 Milward's scale, tinned, No. 1361, are what I like best. This may not sound very exciting, but it is surprising what vicissitudes can be experienced even in fishing for mullet, and how very absorbed one can become, and alack and alas ! how very often one manages to lose one's fish. A good large landing net is distinctly a *sine quâ non,* and the larger the better, and as this sort of fishing is generally carried on from a pier or landing stage, your net should have a good long handle so that you may experience to the full the benefit of not having to bring the fish too close to the pillars or supports. Pier supports seem to exercise an irresistible attraction for a hooked fish, they rush to them as a needle to a magnet, and when once there it is generally a case of " Good-bye dear, see you again soon," as your line comes home, clean cut by the minute shells and rough sea growth which is invariably found in these situations.

Unlike the bahmin, which loves the rushing, tumbling, broken water, mullet affect the still and quieter waters and are more often found in quiet bays near rocks, and also in docks and wet basins among the shipping. The best places I know are Aden, and Port Blair in the Andamans, Perim Harbour, nearly all the bays and inlets about Bombay Harbour, while Suez Roads and the Suez Canal are simply full of them. Favourite spots in Aden Harbour are off the Post Office Pier and the Gunner's landing stage. There used to be two officers stationed in Aden who were adepts at this class of fishing, one especially so, who used always to be very successful among the larger fish, and who now has turned his attention of later years to the bahmin, chiefly through having gone out with me ; and I know of one occasion when, one day, a 5-lb. fish was caught from the verandah of the present Aden Club. In Perim they are to be had round the landing pier by the lighthouse. In Bombay you will nearly always see men and boys fishing for them in the Prince's Dock, off the Dock walls, and in the hot weather there are a good many to be had in the wet basins inside the Government dockyard.

The Gar Fish. (*Belone strongylurus, Hemiramphus far*).—I have no doubt that most of your readers have seen and know what the Garfish is like, as he is not at all an unknown quantity in English waters, but to those who know him not I may here remark that he more resembles a pike than any other fish with his long tapering snout and well-armed jaws. I have at the head of this paper named two species, the one *Belone*, the other *Hemiramphus*. The former is orthodox in every way, possesses a pair of jaws, and has nothing very odd about him ; but the latter dispenses altogether with an upper mandible, and goes about this wicked world with only an underlip sticking out, and moreover seems, like the wicked, to thrive exceedingly. It is rather a peculiar sight and slightly disconcerting to the beginner to see the fish sail up to the bait, and then when you expect to see him take it between his jaws, lo and behold only a gap appears above his projecting snout, and the top of his head seems to disappear and your bait vanishes from view. It is as if this most polite fish had taken off his hat, put his dinner therein and replaced his head gear, and before you have time to realize that he has simply opened his mouth, he is off with a rush—and such a rush. I always think that garfish of both sorts, size for size, make the most brilliant play on a light rod of any fish I know, the only fish to be compared with them being a well-fed lusty English trout in full season. In their runs they dart about all over the place, and being of a long, lithe build, their struggles are acrobatic to a degree, and one requires to be very tender with them. I have said that they resemble pike, but it is only in their outward and visible form. In their way of sporting, in the habit they have of lying close behind piles, rocks, basements of piers or lighthouses, by dock gates, or under a ship's stern—in fact, anywhere where they can find shelter, and provided it is in a good tideway with a rush of water, they much more resemble trout. Here they will lie for hours, keeping stationary with occasionally just one lazy wag of their tail, until perchance they perceive some tit-bit passing, and then, with a movement like a lightning flash, they are out and have seized their prey and are back again waiting and watching for more. Ever on the alert, eyes lifting all around for what they can seize, they remind one involuntarily of the enemy of mankind who is said " to go about seeking whom he may devour."

Like trout, too, they feed on the top as well as in mid water, and very often when nothing else will tempt them, an ordinary large sized English trout fly thrown deftly and quietly in front of them will tempt them to their doom.

This is by far the prettiest sea-fishing there is to be had, and many an hour have I spent over it. Ordinarily, however, one fishes for garfish with a small fish for bait, varying the size of the bait to suit the size of the fish about, but in every case it must be fine and far off. I have found that it is always best when possible to use the fish-bait alive, just keeping it on to the hook, either by passing the hook through its lip, or better still, just under the skin behind the dorsal fin, and then simply letting it roam. In hot weather it is very difficult to keep the fry alive, and if used dead, they should be spun. Under these circumstances a small spinner of sorts is most useful. I personally like the Chapman best, and I use the smallest size I can get, and have had many and many a run and lost many and many a fish.

However much garfish like the fry, there is one thing that they like much better, and I know of no bait that comes up to it for downright deadliness. It is the common cockroach—not the insect that runs about the kitchen at home which is more of the nature of the black beetle, but the luscious full-powered odoriferous "janwa" that is always to be found roaming about ships that have been in the Eastern trade and which are so common and, I think, peculiar to Oriental and tropical countries. Every one who has ever sailed out here knows them well. They possess a peculiarly strong pungent and disagreeable smell and are perfectly fiendish in their capacity for destroying one's boots, books, clothes, &c., and their activity is such that it takes a smart boy indeed to kill one even in the open, while in a ship's cabin full of nooks and crannies, he seems to carry out his own wicked will and go his own aggravating way with absolute impunity. You may catch him in *flagrante delicto* and carefully raise your slipper and determine in your own mind that in one second more his blood shall stain the heather—or your best counterpane—and crash, bang down comes the slipper, as you think, on his devoted head; but nothing of the sort ; he has executed most neatly a strategic movement towards his own particular corner, and the only thing you will see will be his long antennæ waving as he disappears down some chink probably between the boards of your bunk, only to appear shortly in some other place, from which he will watch his chance as soon as he feels assured that the coast is clear, to be up to his tricks again. With such a brute to deal with, it can easily be imagined that it is almost as difficult to catch your bait as it is to catch your fish, and truly so have I found it. While on the subject of the cockroach I may tell you that the only satisfactory way I know of catching them is to get a few open gallipots or large-mouthed pickle bottles and put a small quantity of a mixture of beer and sugar in the bottom and place these in the cupboards and store rooms which they frequent. If you are in a ship blessed with cockroaches you will soon get as many as you may want. It is almost incredible how many can be caught in this way even in a ship where, as a general rule, they are not much in evidence, and when, if you were asked if there were any, you would probably indignantly deny their existence.

Now taking for granted that all these obstacles have been overcome, there is still one last and great difficulty. This is the absolute and invincible repugnance that ninety-nine men out of every hundred have to touch the creature at all. Cold-blooded and case-hardened as I am and have become by years of worming, daping, &c., with all sorts of baits alive and dead, it was a long time before I could make up my mind to seize the creature and hold him sufficiently tight to put him upon a hook. But it had to be done, and eventually I got over that difficulty ; but even to this day there are many unpleasant things I would much rather do. The stench he leaves behind on one's fingers hangs about them for days in spite of even "Sunlight Soap," but once on, the effect is simply magical. If the fish are anywhere about you have only to dape in their neighbourhood. They appear simply rampant, and you can see them darting forward for this particularly tasty morsel, nothing will keep them off it. I remember one afternoon, with the ship anchored in the outer harbour at Port Mahé, Seychelles, when a shoal of *Hemiramphus* came round under the stern. Several of the fellows on board were trying to coax them but to no effect. I had been rather busy all day and could not spare the time, but later on in the afternoon having secured a bottle full of really lively, high and evil-smelling cockroaches, I got into a small boat under the ship's stern and began operations. Nearly every cockroach accounted for a fish, and in about one and-a-half hours I had landed into the small boat some twenty-seven of these fish—and a very fine and even lot they were, from about 1¼ to 1¾lbs. apiece. Of course there was a general cry for cockroaches, but very few could be obtained off-hand, and even when they had been procured, few were there among the anglers who cared to handle the loathsome beast. I know no better place for *Hemiramphus* than the Seychelles and Andaman Islands. In Aden the *Belone* appear largely to predominate. For this a light single-handed rod only is required. Here again I use my " Bickerdyke" with ordinary fine trout tackle, and best of all for cockroach baiting is a very fine 3 hook " Stewart" tackle. Upper hook inserted in the thorax, middle in abdomen, leaving the lower hook loose, hanging just clear and below the bait. No fish, as I have said, can resist this bait and few escape the Stewart tackle.

The one drawback to mullet and garfish fishing, as I have described it, is that the best of it is to be had during the hottest and stillest hours of the day, and a breathless day with a burning sun usually produces the best result from the fisherman's point of view. You ought to be careful in going out that you are properly protected from the sun. It does not add to one's enjoyment to feel a splitting headache coming on, or to feel one's neck, lips and nose smarting under the effects of sunstroke. If it were not for this, or if perchance it could be carried out in cool places and breezy weather instead of off the burning rocks or from an open boat, then indeed would it be the *dolce far niente* of sea fishing.

MISCELLANEOUS NOTES.

No. I.—A MARK ON THE SKIN OF A MAN-EATING TIGER.

In 1894 a tigress with a three-quarter grown male cub was the scourge of the valleys at the foot of the western slope of the Amboli Ghât in the Sawantvadi State. The tigress killed and mauled many men and women, but, instead of eating, used to toss them over to the cub, who always preferred human to animal flesh. I went out several times after the pair, and though my anxiety was naturally to bag the tigress, that of the villagers was that I should kill the cub, for, they said, the mother will not attack human beings if there is no one to eat them. The villagers declared that the cub was born with the propensity for man-eating, and assured me that when it was killed, I should find the "man-eating mark" upon it. I asked what this might be, and was told a distinct cross on one side of the body, generally the left side. I laughed at this idea, but found that it obtained universal credence.

On the 1st January, 1895, I shot the cub, and as the beaters came up, the headmen said to me, "Now, Saheb, we shall see if the men-eater's mark is there or not." The cub was lying on his left side, where he had fallen to one bullet. We turned him over, and, sure enough, there was the mark. I send you herewith a photograph in which it is distinctly visible. It will be interesting to know if any of your readers have had experience of similar marking, or a similar belief ; the villagers could not have *seen* the mark, yet six weeks before I killed the beast they told me I should find it. Is it possible that the superstition is confined to the jungle country bordering upon Roman Catholic Goa ? The villagers were Hindus and not Christians.

I shot the tigress afterwards, but that is another story.

W. B. FERRIS, Lieut.-Col.

Sadra, 10*th October*, 1898.

No. II.—A BUSH QUAIL AND RAIN QUAIL LAYING IN THE SAME NEST.

On the 12th August I found a quail's nest containing twelve eggs. Six were white and oval and six were pointed and yellowish-brown, evidently a Jungle Bush Quail (*Perdicula asiatica*) and a Rain Quail (*Coturnix coromandelica*), laying in the same nest. I have since then visited the nest and have on three occasions seen the bush quail leave it. The nest was fairly well made of grass, under a dried-up piece of indigo about a foot in height. There were often a pair of rain quail near the nest, that is to say, about twenty or thirty yards away ; but I never saw any at the nest itself. This fact of two different species of quail laying in the same nest must be unusual.

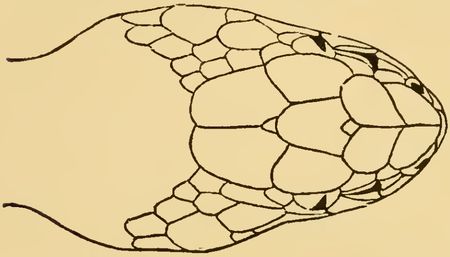
E. C. HARINGTON, Lieut., R.A.,
Hyderabad Contingent.

Bolarum, Deccan, *September*, 1898.

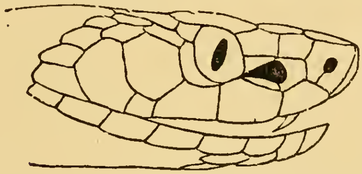
No. III.—NOTES ON 26 SPECIMENS OF THE POHUR, OR HIMALAYAN VIPER (*ANCISTRODON HIMALAYANUS*).

During my two months leave in Cashmere (June and July), I had the good fortune to obtain thirty-nine specimens of the *Ancistrodon himalayanus* all captured in the Lidda Valley around Pahlgam at an altitude of 7,500 ft.

This snake is exceedingly common here, where it is called by the Cashmerees "pohur," and is reported by them to be very fatal, not that native evidence in this direction is of much value. The poison fang is well developed, and enjoys a good range of movement, about 90 degrees, but the poison gland is very small.



Most of the specimens were brought to me by natives, thirteen in such a state of mutilation that I took no notes upon them. A few were, however, found and captured unhurt by me. The following characteristics I was able to glean of their habits, &c :—



Like many of the snakes in temperate climates, they enjoy basking in the general warmth of the sun, lying out on the grassy slopes or in the sunny patches of the chequered sylvan shade. When disturbed, they move cautiously, and not over-quickly, to the nearest cover, long grass, a bush, or beneath holes or rocky recesses.

In the evening they retire to these haunts, and apparently do not inhabit holes in the earth in these situations.

Their movements in locomotion and when on the defensive are comparatively sluggish, and they avoid, rather than strike at, a stick or other menacing agent until repeated molestation. One peculiar characteristic which fascinated me considerably, and which I observed in all my living specimens, and which I pointed out to several of my friends camping around, is the way that this species, when molested, coil themselves ready for defence and vibrate their tails vigorously. This is very interesting when one considers that this species belongs to the rattle-snake subfamily, not that this behaviour would appear limited to the "*Crotalinæ*," for I have noted this in at least one specimen of *Tropidonotus stolatus*, and others have recorded similar instances *occasionally* regarding species outside this subfamily.

Many of my specimens were pregnant females, and I found usually five to seven eggs in various stages of maturity. The more highly developed showed on their dorsal aspects a transparent window (part of the egg envelope) covering an oval chamber with clear fluid contents, in which was suspended an embryo, coiled upon itself in a spiral manner, each spiral consisting of some three to four coils. The aqueous chamber was itself embedded in the homogeneous yolk-contents of the egg, which material decreased in amount as the aqueous chamber increased in size to accommodate the growing embryo within. These immature embryos measured about 2 to 2½ inches unravelled. The *Ancistrodon himalayanus* (in that locality) appears to subsist exclusively on the *Bifosoma himalayanus.* I found as many as three adult specimens in the intestine of one specimen, but I never found any other creatures digested, either reptile, insect or worm.

Description.—Length of longest specimen 2 ft. 1½ ins.; tail 1½ ins.

Scales.—*Anterior corporeal* (one to two inches behind head)—21, all strongly keeled except last row, where keels are distinct, faint or absent; present, 14; absent, 12.

Mid corporeal—21, all strongly keeled except last row, where keels are distinct faint, or absent; present, 17; absent, 9.

Post corporeal (one to two inches before vent)—17, all keeled, last row keels present, 25; absent, 1.

Ventral—(149—164) evenly rounded on to flanks.

Anal—Single.

Subcaudals—(34—52) double.

Rostral—Broad as high.

Internasals—2, obliquely placed, diverging backwards.

Prefrontals—2, larger than internasals.

Frontal and supraoculars.—Subequal, latter not divided.

Parietals—2, larger than frontal.

Nasals—Variable. Usually semi-divided, a suture running from nostril to first labial.

(*a*) A more or less developed furrow, *not a suture* running upward to internasals. Thus in (16).

(*b*) Less commonly quite divided (6). In three specimens divided completely on one side and incompletely on opposite. In one specimen semi-divided on one side and undivided wholly on opposite.

Nostril—Almost entirely situated in the anterior and larger half of the semi-divided or divided nasals; equidistant from internasals above and first labial below.

Loreal pit—Placed between 3 scales—

(*a*) one anterior large and concave, wedged between a supraloreal and 1st or 1st and 2nd labial;

(*b*) one superior, fillet-like, and forming the 2nd preocular scale; and

(*c*) one inferior and fillet-like, forming the 3rd or lowermost preocular scale (though it does not actually reach the eye). The two latter converge to meet at an angle in front of the eye, hence the loreal pit is triangular with its apex backwards. (This is the invariable arrangement.)

Supraloreal—Placed between 1st or superior preocular and the nasals.

Preoculars—3. 1st, superior largest ; 2nd and 3rd, fillet-like, converging towards eye ; 3rd, not actually in contact with eye.

Postoculars—Usually 2, occasionally 3, the inferior passing well beneath the eye, separating the 3rd or 4th labials from the orbital ring.

Temporals—2 and 2, or 2 and 3. The anterior inferior, one very large and labial-like. Not keeled.

Labials—Usually 7, 3rd entering the eye.

(*a*) 2nd, smallest ; 3rd and 4th, large ; 5th, very small ; 6th, largest. (17 specimens.) Less frequently 6, 2nd entering the eye.

(*b*) 4th, small ; 5th, largest. (5 specimens.) In 2 specimens (*a*) arrangement on one side, (*b*) arrangement on the opposite. In 1 specimen 8, 3rd entering the eye on one side.

In 1 specimen this last arrangement only on one side ; (*a*) arrangement on the opposite.

Eye—Moderate, lateral inclined slightly forwards.

Iris—Black, dusted with golden specks.

Pupil—Vertical.

Anterior chin shields—In contact with 3 or 4 lower labials.

Post chin shields—Absent.

3 to 7 gular rows separate ; anterior chin shields from 1st ventral.

Tail—Suddenly and rapidly tapers after vent. Last caudal scale long, equals about 3 of last subcaudals.

Very frequently a small scale is wedged into one or more of the angles between the head scales.

Coloration—Dorsum—Variable shades of olive-brown form the ground-colour, upon which is arranged a very handsome and irregular series of markings picked out with deep sepia, and with centres of the ground-colour, so as to give an effect very similar to a carpet pattern, and so arranging themselves in the middle of the back as to have a more or less well-defined zigzag line of the ground-colour centrally.

The flanks are beautifully mottled with pale sepia-grey, deep sepia, and olive-brown, with enamel-white dapplings at the side of the neck.

Head a darker shade of the ground-colour, with dark markings on the prefrontals, frontals, supraorbitals, and parietals. A dark streak from the eye to the gape picked out boldly with enamel-white.

Lips, chin and throat whitish or pale pink, usually the fourth and fifth lower labial sutures are pigmented. In dark specimens all the sutures are pigmented, and in light specimens none are sometimes.

The underparts consist of a very fine mottling of red, dirty white, and sepia-brown, like a mixture of pepper, salt, and red pepper, on a dull plumbeous ground-colour.

It is worth while remarking the semi-divided condition of the nasals, and the fact that one labial invariably enters the eye, usually the third, sometimes the second, also the absence of post chin shields. Boulanger's work does not mention these characteristics.

F. WALL, CAPT., I.M.S.

MALAKAND, *30th October*, 1898.

No. IV.—OCCURRENCE OF THE ALPINE SWIFT (*CYPSELUS MELBA*) IN THE DARBHANGA DISTRICT, TIRHOOT.

On the 9th and 10th of last month I saw four or five of the above species flying near my indigo vats. They were quite close to me, and I could *plainly* see that there was no white on the rump, and that the underparts were white. Unfortunately, I had run out of ammunition, and so was unable to secure specimens. I am, however, certain that I identified them correctly.

C. M. INGLIS.

DARBHANGA, *August*, 1898.

No. V.—BREEDING OF THE WHISKERED TERN (*HYDROCHELIDON HYBRIDA*) IN THE DARBHANGA DISTRICT, TIRHOOT.

I found numbers of these birds breeding here in one tank on the 2nd of this month. My attention was first drawn to them by the birds flying down at me, some of them nearly striking my hat. I sent in my syce, and he got several eggs, and found a number of nests in which there were no eggs. Although there were two other tanks only a few yards away, no birds seemed to be breeding in them. The nests were made of young paddy shoots with a lining of dry straw. In one nest there was a *single* very highly incubated egg.

C. M. INGLIS.

DARBHANGA, *August*, 1898.

No. VI.—NOTE ON THE ORANGE-HEADED GROUND THRUSH (*GEOCICHLA CITRINA*, LATH.).

This morning I shot a male of the above species, and, on examining it, noticed several long hairs springing from the nape, in much the same way as they do in the white-throated Bulbul (*Criniger flaveolus*). Also the feathers on the cheeks and sides of the chin have lengthened shafts of a black colour. I can find no mention of either of the above facts in Oates' Vol. II of the "Fauna of British India" series. Under Family *Turdidæ* he mentions that in some genera the shafts of the *forehead* are somewhat elongated, but there is no mention of the long hairs from the nape, nor of the lengthened shafts of the cheeks and chin. Is this a characteristic of the whole genus *Geocichla* or only of the above species ?

C. M. INGLIS.

NARHAR, MADHUBANI, 28*th November*, 1898.

No. VII.—BIRDS TAPPING AT WINDOW-PANES.

The European species of Yellow Wagtails are well known to have the habit of tapping at window-panes. Our common Ceylonese wagtail (*Butydes viridis*) has the same habit strongly developed, and is often a great nuisance by its incessant tapping at the bungalow windows. Another bird has just now commenced the same trick. The window-tapper in this case is the common Indian Tailor-bird (*Orthotomus sutorius*). This (presumably) same individual has been persistently attacking the windows on one side of my bungalow for the last two or three months. It perches on the sill, apparently takes aim, and then gives a rapid series of prods against the pane, varying the performance occasionally by fluttering and scrabbling against the glass.

I caught one of the wagtails in a butterfly net, as it was going through this performance. I found the end of its beak quite blunted and worn down by long continued indulgence in this extraordinary habit.

Has any really satisfactory explanation been brought forward ? I have heard it suggested that the birds are pecking at flies; but there have been no flies on the windows in the cases that I have observed. They certainly do not want to get into the room, as, when that particular window is opened to admit the tapper, it only flies off and attacks another window. Another suggestion is, that the bird is attacking its own reflection under the impression that it is a rival. Its attitude and action is certainly more in accordance with this idea. But when once commenced, it seems to become a craze, impelling the bird to return to the attack again and again. The wagtail that is at present on duty at my bungalow always goes through the same tactics. It parades along the guttering for a short time, then launches itself downwards against the bottom pane of the glass, getting in three or four rapid pecks before it gravitates to the sill. Then it returns to its promenade on the gutter, and repeats the motion until it has exhausted the patience of the occupants and been driven away. From its position on the gutter it can scarcely, if at all, see its reflection in the glass.

It would be interesting to know if any other birds indulge in this habit —or madness.

E. ERNEST GREEN.

PUNDALNOYA, CEYLON, *August*, 1898.

No. VIII.—EARLY MIGRATION OF THE RUDDY SHELDRAKE.

It may interest you to know that, on the 15th July this year, two Ruddy Sheldrakes (*Casarca rutila*) settled down on the piece of artificial water we have in the Zoological Gardens here. We have four or five of these birds in our collection, and the wanderers made themselves quite at home for the space of twenty-four hours ; they disappeared again during the night. The fact of these two birds passing over us so early in the year seems worthy of notice.

T. L. F. BEAUMONT.

KARACHI, *August*, 1898.

No. IX.—BOMBAY RATS.

To kill rats is the duty of every good citizen of a great city like Bombay, and the probability of a recrudescence of the plague this cold season makes the duty more imperative. I am writing in the hope of inducing members of this Society to turn their attention to the rats killed in their houses. We are apt to regard all rats as simply rats, belonging to the genus pest, and lying almost outside the domain of natural history; but there is a great deal to be cleared up yet about the rats of Bombay, and the publication of "The Fauna of British India" seems to me only to have added to the perplexity with which the subject was invested before. During the last two months I have caught eighteen rats in my bungalow at Uran. Seventeen of these belonged to the form which I have known for years as the common house rat of the Bombay Presidency. They differed in no respect from each other except a little in size, for some were young and some old. The colour was brown, made up of tawny and grey, with a sprinkling of black hairs, principally along the line of the back. The under-parts were scarcely lighter than the upper, but were more purely gray. Till a few years ago the thought had never risen in my mind that this was anything else than *Mus decumanus*, the too-well-known Brown Rat of Europe. But when I met Mr. Oldfield Thomas at the British Museum, he assured me that it was nothing of the sort, but only one of the many forms of *Mus rattus*, the Black Rat of Europe. When I asked him the difference between them, he said that the essential difference was in the shape of the skull, but that the Brown Rat might easily be distinguished by its coarser hair and shorter tail. In the "Fauna of British India," Mr. Blanford has followed Mr. Thomas. He says that the so-called Black Rat varies very much in size and colour, and he describes three of the principal varieties or races of it ; but one mark by which, according to him, the true Brown Rat that may be distinguished from them all is, that its tail is never so long as the head and body. By this mark seventeen were undoubtedly Black Rats, though not black. One specimen, 7 inches long, had a tail 8½" ; another, 6 inches long, had a tail 7", and so on. Their fur also was too fine for *Mus decumanus*. My eighteenth rat was quite a different creature. On the upper parts its colour was a richer and more reddish-brown, while all the under-parts were pure white, and the feet were pink. But there were other differences also, besides those of colour. Its face was much rounder, its snout not so long, and its eyes very large and beautiful. In fact, it looked quite a different animal. This form has also been familiar to one for many years as a species of jungle, or tree, rat, only coming into houses occasionally; but while we had only Jerdon's and Sterndale's books to go by, it was impossible to identify it with certainty. I put it down as probably *Mus brunneus*. The "Fauna of British India" has swept away all doubt. It is another form of *Mus rattus*, the Black Rat. In fact, it would seem that *Mus rattus* may be regarded as a semi-domesticated animal, like the pariah dog, in the case of which colour and size count for nothing. But, in this view there is still a difficulty to be explained. Why did I get seventeen of one form and one of the other, instead of three or four of each and half-a-dozen intermediate? And this argument does not rest on these eighteen specimens, for, as I have said, both forms have been familiar to me for many years, and are as distinct in my mind as the two species of crows. If they refuse to intermix, and so keep up their distinctness, and yet are the same species, then what constitutes a species? It is rather significant that in the same museum where Mr. Thomas is classing rats by the measurements of the skull, and treating colour and outward appearance as of no account, the pillars of the entomological department are splitting our most familiar butterflies into a multiplicity of species distinguished by the brightness of a spot, or the breadth of a "fascia." However, it was not to dispute Mr. Thomas' conclusions that I took up my pen; but I think that, in view of them, it would be interesting to collect more information than we yet possess about the different varieties which make up the rat population of Bombay, and the numerical importance of each variety. It would be particularly interesting to know to what extent the real Brown Rat (*M. decumanus*) has settled among us and dispossessed the other. This question has a practical bearing in connection with the plague, for the Brown Rat, I believe, like the Bandicoot, lives mostly on the ground, and is very much at home in sewers, though it can climb well when it likes, which the Bandicoot cannot do; while the Black Rat is by nature an inhabitant of trees, and, when it comes into a house, always lives in the roof.

I may mention that all my eighteen rats were males. This throws a sad light on the social life of the rat. The significance of it is, I believe, that the mother has to seek remote and secluded places to bring up her family, lest their own parent should find them and eat them. Rabbit fanciers know that the buck must be kept in a separate hutch till the young are able to run about for the same reason. This trait appears to be characteristic of the *Rodentia* generally. Nearly all the squirrels that came about our houses and gardens are males.

E. H. AITKEN.

URAN, *29th September*, 1898.

No. X.—A WASP AND A FLY.

The following incident, bearing on the most interesting of all questions in Natural History, namely, animal intelligence, seems worth recording. I hope it may stimulate entomological members to collect more evidence, *pro* or *con.* About the beginning of September a large reddish-brown wasp (*Eumenes conica*, I think) having built a chatty-shaped clay cell on my bed-room door and stocked it with caterpillars and closed it, began another. As it flew in with a pellet of clay, I noticed that it was closely pursued by a fly not much larger than a common house-fly, but curiously marked with longitudinal gray stripes. When it commenced work, the fly alighted, at a distance of four or five inches, and waited. When it finished and went off for more clay, the fly instantly flew up to the cell, but after a moment's examination, retired again to a distance of four or five inches and waited, facing the cell. Again the wasp came with a pellet of clay, worked it in, and went off for more. This time the fly did not examine the cell, but waited where it was. Just at this point the Boy announced breakfast, and I went away, supposing the wasp would take half-a-day to finish the cell. What was my disgust when I came back to find the cell finished and the fly gone. In ordinary course I believe the cell should have been stocked with caterpillars in the course of the next day ; but as I went to Bombay, I did not see this being done. When I returned, however, the cell was sealed up. No more were made at that place, which seemed strange, for they are generally built in clusters of six or seven.

A week later I broke open the cells and found in the first a pupa, evidently, from the size, a wasp pupa, enclosed in a loose bag of silk. In the second cell there was *nothing*. The larvæ of some flies develop with remarkable rapidity, and it is conceivable that in this case the egg laid by the fly might have produced a voracious larva, which might have cleared the larder, devoured its rightful owner, passed through a rapid pupa stage and escaped by some hole which escaped my notice, all in the course of ten days. But in that case there must have been remains, pupa case, excreta, &c. There was nothing of the kind.

It was clear that the wasp had sealed the cell without stocking it. Had it discovered that it was being cuckolded ? The thing is not impossible. It may have caught the fly in the cell, in the act of depositing its egg, or it may have observed the foreign egg as it was about to lay its own ; and it may have at once closed the cell and abandoned the place. Every one who has watched these parasite flies knows how warily they follow their victims, keeping some inches behind them. A curious circumstance is that another lot of five cells was begun and finished soon after this, at another place in the same room. The builder may not have been the same wasp, but I could not distinguish them from one another.

Another feature in this case, almost more interesting, is the behaviour of the fly in examining the cell immediately after the wasp left it the first time, and not doing so the second time. A naturalist ought not to assume anything, but he must be a captious man who will object to the assumption that, when the fly examined the cell the first time, it saw that it was just begun and *knew* that it must take some time to finish. They never lay their egg, I believe, until the cell is actually finished and ready to be stocked.

E. H. AITKEN.

CAMP OOLWA, *7th November,* 1898.

No. XI.—BULL TERRIER AND TIGER.

I believe it is well known that a tiger will retreat before a pack of dogs, but that a single bull-terrier will put a tiger to flight, drive it from cover when wounded, and finally attack the beast, appears to me to be an occurrence sufficiently remarkable to be worth recording, even were not the other circumstances in connection with the encounter I am about to describe of a most unusual nature.

On November 18th last, a gardener came to tell me, at about five o'clock in the evening, that a panther was in the compound of an unoccupied bungalow in this station (Jalna), where he was employed. I received his statement with reservation, knowing that the native is prone to exaggerate. However, I took my rifle, and accompanied by Lieut. A. R. Burton of my regiment, together with my orderly and a few native servants, proceeded to the spot, which was about fifty yards from my bungalow. The compound where the animal was said to be located contained several thickest hedges, disposed in parallel lines, and a large patch of long grass. We looked in all likely places but could see nothing. We then went to the far side of the patch of grass telling the men to walk through it, and drive any animal that night be there in front of us. Then there was a rush and a roar, and in a moment not a panther but a tiger cleared the hedge and road in front of us, and disappeared behind the hedge of the next compound. Here was a hard case. We could not see where the tiger was. Beyond the compound in which he had disappeared the band was playing, and the ladies were playing tennis, whilst a party of officers and men was engaged at hockey close by. Bungalows surrounded us on three sides. A cry was raised that a tiger was afoot, and there followed a hurrying to and fro. People rushed in all directions, some looking for rifles, others for safety. Then one of my servants came up and said that my orderly had been mauled. I was astounded. The rush and roar of the tiger had seemed to be almost simultaneous with his disappearance over the hedge. The catastrophe must have happened all in a moment. The man was badly wounded, and was carried into a neighbouring bungalow. Evening was now drawing on. The greater number of officers appeared on the scene with rifles, and were with some difficulty assembled. We cleared the front as far as possible : a gun was posted in a tree ahead, and we proceeded to walk up the tiger accompanied by the bull-terrier Sal. Soon Sal commenced barking at the corner of the hedge, and shortly she put up the tiger, which gallopped across our front followed by the dog and a general fusillade. It was so dark that sights could not be seen, but the tiger appeared to have been struck by at least one bullet. We all gave chase, and the brute now squatted in a thick part of the hedge, as was evident by the dog's barking, but we could not see it in the darkness, and it refused to move, although we advanced to within five yards of it. Reluctantly we had to abandon the chase for the night. Next morning blood was found, proving that the tiger was wounded, and its tracks were discovered in a grass-filled nullah about a mile from the cantonment. Here all trace of the animal was lost, and we failed to find it although we went through the grass in line.

For five days nothing was heard of the tiger. On the afternoon of November 23rd I was riding through a village some five miles from Jalna, when I heard that a villager had been seized and wounded in a jowari (millet) field close by. I saw the man, who was badly mauled and died two days later. I then went to the field and found marks of the tiger. The crops were very long and thick, and we tried in vain to find the animal. Next day we organised a beat, and I tracked the tiger about half a mile, when the spoor was lost owing to the nature of the ground. A dragging hind leg showed that the animal was wounded severely. On November 26th I pitched my camp, in company with Lieut. Lane of my regiment, seven miles out from Jalna, near the place where the last tracks had been found. That day I discovered tracks two days old, showing the direction the tiger had taken. Next day I tracked some miles farther, and after a hard day's work we came upon fresh pugs leading up a small deep ravine, branching from a large nullah. The nullahs were in places filled with thick bushes, but the country generally was open, and contained no trees. There were with us about 8 or 10 sepoys and villagers, and the good dog Sal. I posted Lane and myself at two branches at the head of the ravine, and put in the men to drive the beast towards us, three of them armed with rifles and accompanied by Sal. About half-way up the nullah they came upon the tiger, which Sal drove from cover. The animal broke about fifty yards from Lane, who got a snap shot. Whether he hit or not cannot be known. We then ran after the tiger, and finally headed it into the main nallah, where it took refuge in some thick bushes. Again Sal went in and this time went straight for the tiger, receiving some nasty wounds in the encounter. However the plucky beast went in again, and by continuous barking revealed the position of the tiger. The latter was now crouched in the bushes, which the bleeding and exhausted dog had left. Showers of stones failed to move the tiger. It was now getting late, the beast was a danger to the country and must be killed. The only thing possible was to go in and look for it. A long search ensued, and we at length discovered it crouching in the bushes, where a few shots put an end to its existence. That the dog Sal was greatly instrumental in securing a successful issue to the hunt cannot be denied, whilst it may also be conjectured that her presence saved one or more men from a severe mauling, and she at least deserves such immortality as this journal can confer.

The place where we eventually brought the tiger to the bag was some twelve or thirteen miles from Jalna, a fact which shows what a long distance an animal will travel, although severely wounded. A bullet fired when the beast was first found in cantonments had passed through and broken the hind leg about half way between paw and hock, whilst another bullet was imbedded in the off fore-paw.

Perhaps the most remarkable part of the occurrence was that a tiger should have been found in such a locality. Jalna is a remote station, before the mutiny it was occupied by a large garrison, situated oasis-like in the midst of a comparatively desert country. As far as I know there are no tiger-haunted jungles within fifty or sixty miles. Whence, then, did the animal come, and why did he leave the seclusion of his native jungles ?

R. G. BURTON, Captain,
1st Infantry, Hyderabad Contingent.

Jalna, *November 29th*, 1898.

No. XII.—THE NIDIFICATION OF SOME MALAYAN BIRDS.

The Dusky Broadbill (*Corydon sumatranus*, Raffles).

Mr. Blanford (" Birds," III, p. 6) says that the nest of this Broadbill does not appear to have been recorded.

I found a nest on June 20th this year, suspended from a single hanging shoot of thorny rattan, and hanging some 20 feet above the steaming mud at the edge of a boiling spring in the thick jungle.

The nest was an enormously long trailing mass (just short of 7 feet in total length) of roots, fibres, creeper, moss, twigs, pieces of dead wood and bark, dead and green leaves, etc., bulging out in the middle to form a chamber about 10 inches external diameter, the entrance at the side protected by a small portico. It contained four very young birds, blind and naked, but easily recognized by the very broad and overhanging upper mandible, and by the yellowish colour of the skin, the young of the black and red Broadbill being pinkish flesh-colour at the same age.

The Duksy Broadbill is a sluggish bird of rather crepuscular habits ; the one or two I have shot had been feeding on a very evil-smelling beetle until they positively stank.

The hot springs which are not uncommon in the Malay Peninsula are a great attraction to many denizens of the forest, and are excellent spots for collecting. The hot mud round them is often cut up with the footprints of sambur, crossed here and there by the deep heart-shaped track of that grandest of living bovines, the bison—the 'Seladang' of the Malays ; the little brown Cuckoo Doves (*M. tusalia*) crowd and flutter in the surrounding trees, while circling slowly round and round in the sulphurous steam, glittering in the chequered light that filters through the foliage, flies that prince of butterflies, the *Ornithoptera brookeana.* But this note was to have been on the nest of the Broadbill—not the fauna of a hot spring.

The Chesnut-backed Forktail (*Hydrocichla ruficapilla*, Temm.)

I do not remember to have seen an account of the nidification of this species. I took a nest in May this year on the Larut Hills, Perak, at 2,500 ft. elevation. The nest, very robin-like in external appearance, was placed in a crevice in a moss-covered rock at the edge of a bridle path, and being covered with green moss harmonized well with its surroundings. It was composed of dead leaves, moss, and clay, the large amount of the latter material employed, making the nest remarkably heavy. There were two eggs measuring 1 in. ×·75 in., glossy China white spotted with rufous, principally in a zone round the larger end, with a few pale purplish-grey markings underlying the spots.

Blyth's Frogmouth (*Batrachostomus affinis*, Blyth.)

A nest in the Selangor Museum is a most beautiful little piece of bird work, a tiny pad (measuring only $1\frac{1}{2}$ long, $1\frac{1}{8}$ in. broad, and $\frac{9}{16}$ in. deep at the sides) composed entirely of the whitish-grey powder-down of the bird, woven into a beautifully elastic felt. Not a particle of any other material has been employed as seems to be usual with *B. hodgsoni* and *B. moniliger*. The nest, too, is much smaller in proportion to the size of the bird. The single egg rests in a fairly deep cavity and completely fills the nest, the under surface of which is deeply grooved by the impression of the thin branch on which it was placed.

The egg is as usual glossless white, and appears to be a good deal smaller than the egg of *B. hodgsoni*, but is unfortunately so broken that accurate measurements cannot be taken.

The date on which this nest was obtained has not been noted.

BUTLER'S FLY-CATCHER-WARBLER (*Cryptolopha butleri*, Hartert.)

(Described Bull. B. O. C., No. LIV, p. 50.)

This new fly-catcher is not uncommon on the Larut Hills, Perak, from 3,500 ft. to the summit of Gunong Ijau—about 5,000 ft. The nests, of which I found several in May, are generally placed in the small caves formed in banks where the soil has been washed away under the overhanging roots of some large tree. They are composed principally of moss, and very closely resemble nests of the little European Wren. One nest contained three eggs, which I now have, pure white and of the usual *Cryptolopha* type. In another nest were three young, which the old birds were feeding with insects regardless of my presence within a few feet. From other nests examined the young had apparently recently flown.

HORSFIELD'S NIGHTJAR (*Caprimalgus macrurus*, Horfs.).

I find *Caprimalgus macrurus* in the Malay Peninsula lays an egg entirely different from that of the Ceylonese race of the same species (*C. atripennis*). A pair of eggs taken in June (bird obtained) have the ground-colour warm buff: one egg is marked evenly all over with marblings of very pale brown and very pale grey; the other is marked with stronger shades of the same two colours, but in this the markings are almost entirely confined to a broad ring round the larger end. The Ceylonese bird lays a buff-coloured egg, sparingly marked with a few round sepia dots.

The Ceylon *C. atripennis* differs, too, in its call-note from *C. macrurus*. The note of the former is invariably a low liquid chuckle of three or four notes; the voice of the latter is a monosyllable which has been compared to the sound made by striking a plank with a hammer.

C. atripennis is certainly only a race of *C. macrurus*, and the above peculiarities are noteworthy, as this Nightjar, by laying two totally different types of eggs in different localities, has caused a little confusion.

A. L. BUTLER, F.Z.S.

SELANGOR, *Oct.*, 1898.

No. XIII.—OCCURRENCE OF THE BLACK-WINGED KITE (*ELANUS CÆRULENS*), DESF., AND THE SHORT-TOED EAGLE (*CIRCAETUS GALLICUS*), GMEL., IN THE MALAY PENINSULA.

There are one or two specimens of the Black-winged Kite in the Perak Museum, shot in that State, and a single specimen in the Selangor Museum, killed here; Blanford ("Birds," III., p. 380) says that it has not been recorded East of Burma nor in Southern Tenasserim.

Looking through some old skins in this Museum I found a very mutilated and moth-eaten specimen of *Circaetus gallicus*, shot at Ampang near here, two years ago. I measured the bird at the time and compared the foot carefully with the figure given in the "Birds of India" (III., p. 356). I intended to have sent it home for the sake of the locality, but unfortunately my taxidermist burnt it by a mistake while destroying some old and valueless specimens.

According to Blanford it had not been recorded East of Bengal up to 1895.

This locality is far out of its range, and the species is not migratory, but I believe I identified the bird correctly, and, after *Butastur teesa* turning up in Australia lately, I venture to send the note for what it is worth, the bird being no longer available for examination.

A. L. BUTLER, F.Z.S.

SELANGOR, *Oct.*, 1898.

No. XIV.—NOTE ON THE WHITE SNAKE (*COLUBER TÆNIURUS*), COPE.

Boulenger, " Reptilia " in "Fauna of India," p. 333.

Ridley, "Jour. Straits Branch, R. A. S.," No. 31, p. 99.

I have just seen, in the Journal of the Straits Branch of the Asiatic Society, a very interesting account of this snake, coinciding with and anticipating some observations on the species which I was going to send in for our Journal. However, Mr. Ridley has given a much better account than I should have done, so I will content myself with a very brief note. *Coluber tæniurus* has a very wide range ("Mantchuria, China, Darjeeling, Cochin China, Siam, Borneo, and Sumatra"—*Boulenger*), but has only been comparatively lately recorded from the Malay Peninsula. Nowhere can I find any information as to its habits and haunts in the other localities from which it has been recorded, and in this Mr. Ridley seems to have been equally unsuccessful. Mr. Boulenger, hampered by limited space, is silent on the subject, only giving the description and distribution.

Here the White Snake occurs only in the limestone caves at Batu, and in similar caves in Perak, living in the dark and damp passages often hundreds of yards from the light of day, and feeding on the bats which inhabit the caverns. It appears to live on good terms with the large toads (*Bufo asper*) which are numerous in the same gloomy tunnels.

When seen by torchlight upon the black deposit of guano which carpets the caves, this snake is a distinctly weird and ghostly-looking creature, appearing pure white by the contrast, and being very conspicuous ; at rest on a ledge of limestone, however, as Mr. Ridley has pointed out, its pale ochreous and grey colouring harmonises perfectly with its surroundings, and it is extremely difficult to detect. Mr. Ridley shows, too, that our Batu cave snakes are much paler in colour than the species usually is as described by Mr. Boulenger. Is it entirely a cave-dweller in other parts of its wide range ? Can any member of the Society give any information on this point ? Should this not prove to be the case, then our pale-coloured local variety must be a specialized form, admirably adapted to assimilate with its subterranean surroundings.

Boulenger says it grows to 5½ feet; Mr. Ridley mentions one 6 feet 7 inches long, and I recently captured a specimen 7 feet 5½ inches in length.

In the caves where it occurs the snake is common, I have captured three in a morning, and seen one or two every time I have visited the caves.

I am sending for the Society's Museum a specimen of the local variety.

A. L. BUTLER., F.Z.S.

SELANGOR, *Oct.*, 1898.

No. XV.—FURTHER NOTES ON THE VARIETIES OF *COLUBER TÆNIURUS.*

Only the other day I contributed to this Journal a note on the highly specialized form of *Coluber tæniurus*, which dwells in the Stygian darkness of the great limestone caves near Kuala Lumpur, Selangor. When I wrote, the snake had only been obtained in the Malay Peninsula in this pale-coloured and exclusively cave-dwelling variety. The much darker typical coloration described by Mr. Boulenger, however, induced me to doubt whether the species was similarly a cave-dweller in other parts of its wide range, and to ask in the Society's Journal for information on this point. I imagine now that the typically coloured snakes are not cave-dwellers, as since writing I have obtained a single *C. tæniurus* in the jungle, and find it quite different from the pale cave-form. I believe this is the only time it has been taken in the jungle in the Peninsula, and the specimen seems to me noteworthy, as it also differs very considerably from Mr. Boulenger's description.

The circumstances under which my specimen was procured were as follows: On the night of October 6th being on a collecting trip, I arrived at a small halting bungalow on the Pahang Road, 8 miles from Kuala Lumpur. There was no light in the bungalow, and I went into the bed-room and felt in the dressing-table drawer for some matches which I remembered to have been there on my last visit. In doing this I put my hand on to a large snake lying coiled up; I felt the coils slide into motion, and as I jerked my hand away, heard the soft thud of the beast's nose against the side of the drawer as it struck at me. I procured a light at once—needless to say elsewhere!—and found the snake to be a large *Coluber tæniurus*, which must have found its way in from the surrounding jungle and been attracted by the rats, of which the drawer contained abundant traces.

The halting bungalow is surrounded for miles by dense jungle; the nearest hills, moreover, are quartz and not limestone, and, as far as I saw—and I explored one of them very thoroughly—have no caves in them at all. The place is exactly 4⅝ miles distant from the big limestone caves at Batu as the crow flies, but far more as a snake would crawl, the intervening country being rough, hilly, and densely wooded. It seemed, therefore, reasonable to conclude that this particular snake was a jungle and not a cave-dweller, and I promptly boxed it alive for comparison with cave specimens, subsequently finding, as I expected, that it belongs to a much darker-coloured type. For convenience of comparison I give in tabulated form descriptions of (1) the pale Malayan cave variety, (2) the typical coloration in other parts of its range, and (3) the jungle variety of the dark race obtained as described above.

The cave-dwelling form, of which Mr. Ridley's description is a very accurate one, seems to be remarkably constant to one type. In this instance, too, the variation in colour, which usually counts for little or nothing in the case of snakes, seems deserving of consideration when associated with, and apparently adapted to, the snake's exceptional habitat and surroundings. It appears to me that this is one of the cases for which the trinomial system of nomenclature is so suitable, and that, though hardly entitled to specific rank, this very marked form might well be indicated as *Coluber tæniurus ridleyi*, subsp. n.

While on the subject of these snakes I may mention that a friend recently came upon one, in the Batu caves, coiled into a cone round a much-crushed but still living bat, from which it appears that they occasionally kill their prey by constriction.

Colour Varieties of Coluber Taniurus.

(1) Description of Batu Cave specimens. (H.N. Ridley, "Jour. S.B.R.A.S." No. 31., p. 99).	(2) Description of typical examples in Brit. Mus. (Boulenger, "Fauna of India, Rep.," p. 333).	(3) Description of Selangor jungle example. (A. L. Butler).
HEAD: Bluish-grey; a black line through the eye.	HEAD: Grey-brown or olive; a black line through the eye.	HEAD: Centre greyish-brown; sides above eye-stripe bluish-grey; a black line through the eye.
NECK: Pale ochreous, each scale being tipped with isabelline.	NECK: Grey-brown or olive. (*Head and neck uniform*).	NECK: For 6 inches* behind head light olive-brown with a strong reddish tinge (caused by two small red dots on the point of each scale).
BACK: Do. getting paler towards the tail. (*No transverse lines or network*).	BACK: Interior portion grey-brown or olive with black transverse lines or network; posterior portion with a pale vertebral stripe between two broad black ones.	BACK: Greenish-olive, paling towards the tail into olivaceous-white between the lateral stripes.
BELLY: Pale yellowish-white	BELLY: Yellowish anteriorly, greyish behind.	BELLY: Creamy white.
TAIL: Has a white bar along the back line, and the under part is also pure white; along the sides runs a purplish-grey bar, becoming darker towards the tip, where it becomes black.	TAIL: A black stripe along each side of the posterior part of the belly and along each side of the tail, separated from the upper lateral stripe by a whitish streak.	TAIL: The lateral stripes at their commencement on the body warm brown, gradually shading into blackish on the tail; an indistinct bluish-grey line along each side of the belly, separating the creamy white of the ventrals from the olive of the upper surface.

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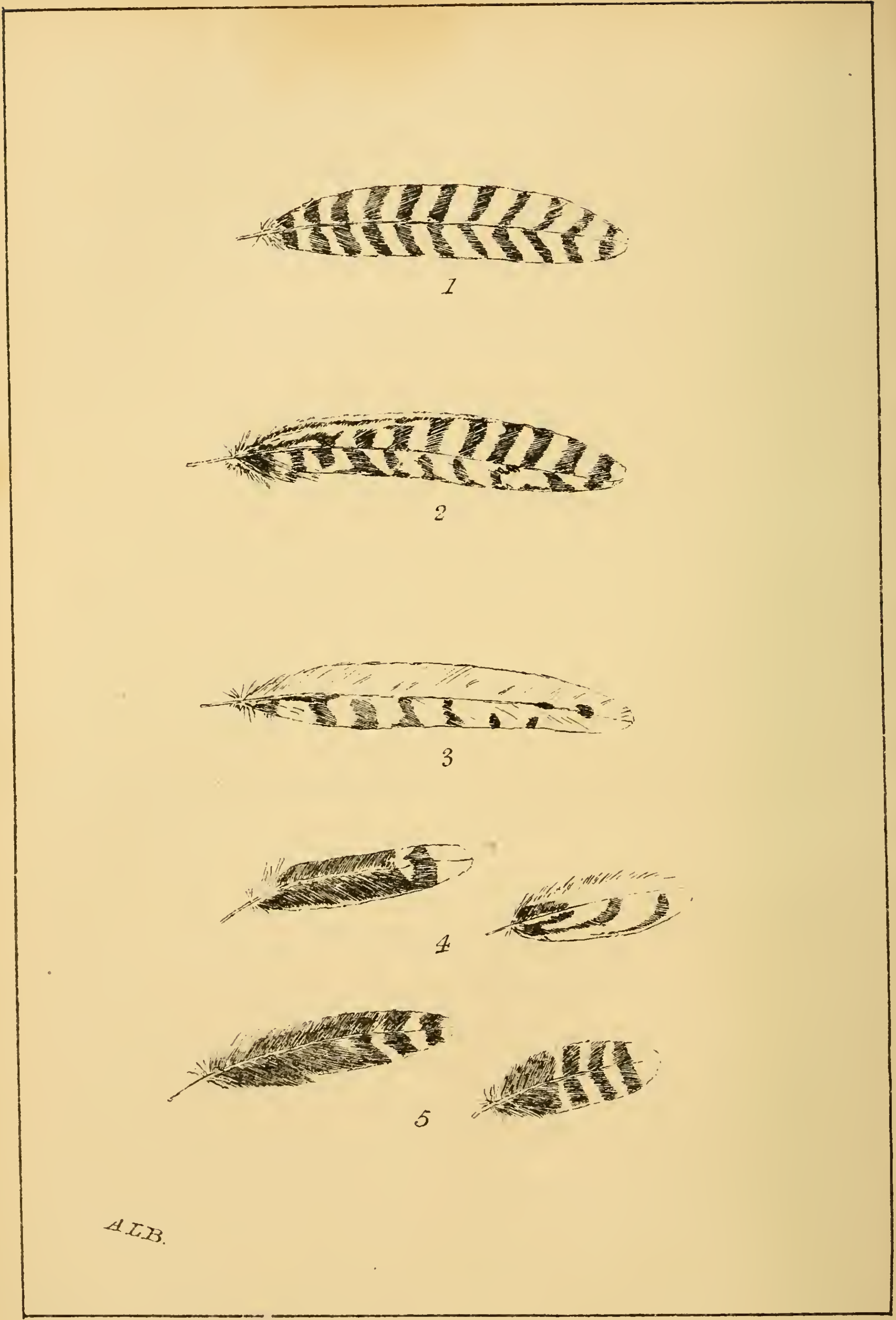
* The specimen seemed about 6 feet in length.

A. L. BUTLER, F.Z.S.

SELANGOR, *7th November*, 1898.



1. *Axillary of a Pintail.* 2. *Ditto darkly marked Fantail.*

3 *Feather of lightly marked Fantail.* 4. *Greater and median secondary coverts of dark Fantail.*

5. *Ditto of Pintail.*

No. XVI.—THE COLORATION OF THE WING-LINING AND AXILLARIES IN THE FANTAIL AND PINTAIL SNIPES.

(*With a Plate.*)

Two specimens of *Gallinago cœlestis*, lately obtained here, represent such very opposite extremes in the amount of grey barring on the wing-lining and axillaries that they are perhaps worth noticing.

Mr. Blanford says of *G. cœlestis* (" Birds," Vol. IV., p. 287) : " Underwing coverts and axillaries barred with brown, but never evenly. The median secondary lower coverts are never barred, and the white on the axillaries in Indian birds always exceeds the brown in amount." Of *G. stenura* he says (p. 289) that it can be distinguished " (2) by the wing coverts and axillaries being regularly and evenly barred throughout with blackish-brown and white, the bars of the two colours about equally broad."

Legge ("Birds of Ceylon," p. 822) says *G. cœlestis* differs from *G. stenura* "in having the axillaries barred with paler, narrower, and much more distant bars ; in having the under wing coverts along the edge of the wing much less barred, and the greater secondary series more on less uniform white, the brown bars being chiefly confined to the base."

Of young birds he says: " The axillaries are more barred, approaching those of the 'Pintail' in character, but the white interspaces are broader than the dark bars, and the reverse is the case in the last named species." (Not invariably.—A. L. B.)

No doubt the above distinctions almost always hold good, but one of my specimens of *G. cœlestis* shows that the " never " once or twice used above might be modified into ' well, *hardly* ever ' !

The darker of my two birds, shot here a week ago by Dr. Lucy of Kuala Lumpur, who kindly sent it to me for the Museum, has the small under coverts along the edge of the wing *very heavily* barred with blackish-grey, the black much exceeding the white, and being also darker than in the three or four *G. stenura* with which I have compared the bird ; the greater secondary coverts are gray for about two-thirds of their length, then have a gray bar much broader than the white interspace, and a broad white tip. The median secondary lower coverts, though conspicuously whiter than any other feathers in the wing, *are* all barred, most of them with a blackish blotch at the base and two long slanting bars on the outer web. The longer tertiary wing coverts have the gray far exceeding the white, and the bars on the axillaries are practically of the same breadth as the interspaces ; some being slightly narrower and some slightly broader ; the feathers on the whole being quite as heavily marked as in an average *G. stenura*.

The coloration of the axillaries in these species has always seemed to me the most easily seen distinction, and my usual plan when looking for "Fantails" in a bag of snipe is to lift the birds by the tip of the wing and just glance at the lining and axillaries ; in this case I should certainly have passed the bird over as a "Pintail," looking only at the under wing.

My other specimen of *G. cœlestis*, shot here by me on October 21st, is very different, having the wing-lining mostly white except just along the edge of the wing. The median secondary coverts are in this case pure white, the larger axillaries mostly white, the lower web only barred, the bars much narrower than the interspaces, and becoming mere small blots towards the end of the feather, the smaller axillaries are white only just mottled with gray, and with a narrow dark shaft stripe near the tip.

Mr. Blanford tells us that the more broadly barred specimens of *G. cœlestis* are, as a rule, European ones.

Of course in the vast majority of birds the difference in the axillaries is most conspicuous, and I mention my heavily barred bird not to throw doubt on the value of the rule, but as an interesting and perhaps rather rare exception to it.

I have noticed that the bars on the axillaries of the "Fantail" often have a tendency to unite at the edges of the feather, sometimes forming a narrow interrupted submarginal line. I have never observed this in the " Pintail."

Another difference given by Mr. Blanford is not always very distinct ; " the outer web of the first primary brown in *G. stenura*, white or whitish in *G. cœlestis*." In both the Fantails mentioned above, this web was brownish along the quill, and entirely dark gray for the last 1½ inch or so ; in some specimens of *G. stenura* I have seen it a very whitish-brown.

While on the subject of snipe I see that *Rostratula capensis* is said in the " Fauna of India " to be " rare in Tenasserim and the Malay Peninsula." It is by no means rare in Perak or Selangor, the only two States in the Peninsula in which I have yet collected.

I send drawings of axillary feathers of a Pintail, and of the lightly and heavily barred Fantails, and of the greater and median lower secondary coverts of the darkly marked Fantail and the Pintail.

A. L. BUTLER, F.Z.S.

SELANGOR, 2*nd Dec.*, 1898.

No. XVII.—ON AN IMMATURE SPECIMEN OF THE BLACK-CAPPED PURPLE KINGFISHER (*HALCYON PILEATA*, BODD.)

On November 4th, I shot a specimen of the Black-capped Purple Kingfisher, which, though obviously little more than a nestling, being very small (bill at gape 2½ in., wing 4¾ in., tail 3 in.,) with the upper plumage dull in colour and the bill short and dark, curiously enough shows hardly any traces of immaturity on the lower plumage.

The bird has a few narrow black *striæ* on the sides of the neck, but the usual crescentic markings so characteristic of birds of the year are altogether absent, except for one or two very narrow edges to the feathers on the sides of the breast. This seems singular, as these markings are usually retained until the bird has been for some time fully adult; six fine specimens all show them more or less, in every case more so than in this very young bird, probably only a few weeks out of the nest, and in which one would expect to find all the breast feathers tipped with a blackish crescent.

A. L. BUTLER, F.Z.S.

SELANGOR, *Dec.*, 1898.

No. XVIII.—OCCURRENCE OF THE EASTERN STOCK PIGEON (*COLUMBA EVERSMANNI*) IN THE MADHUBANI SUB-DIVISION, DHARBHANGA, TIRHOOT.

Yesterday evening my shikari brought me in a single specimen of the above bird. It was one of a large flock which had come to roost in a large mango tope through which he was passing at the time. The only places where this Pigeon has been recorded from, as mentioned by Blanford, are the Punjab, Sind, the North-Western Provinces, and Oudh. I have told my man to shoot me a number of specimens, as coming from a locality, so far as I am aware, unrecorded as yet, they will be worth keeping.

C. M. INGLIS.

DHARBHANGA, 12*th Jan.*, 1899.

No. XIX.—OCCURRENCE OF THE CLUCKING TEAL (*NETTIUM FORMOSUM*) IN GUZERAT.

On 16th December, 1898, while shooting near Juhar, about 20 miles from Ahmedabad, I killed a fine specimen of the Clucking Teal (a drake) and send the skin for the Society's collection. I cannot say whether this was a solitary individual or whether there were more about, as I never noticed, until picking it up with other teal and duck that I had killed, that it was something out of the ordinary. As I have never heard of the Clucking Teal being shot in Guzerat, this may be of interest and worth recording in the Journal.

E. L. BARTON.

BOMBAY, 10*th Jan.*, 1899.

(It is well worth recording, and there is no doubt whatever as to the identification of the specimen procured by Mr. Barton.—E. COMBER.)

PROCEEDINGS

OF THE MEETING HELD ON 13TH SEPTEMBER, 1898.

A meeting of the members took place on Tuesday, the 13th September, when Mr. John Wallace, C.E., presided.

NEW MEMBERS.

The election of the following new members was announced:—Lieutenant F. FitzHugh Lance (Loralai); Captain J. R. B. G. Carter, I.S.C. (Sadra); Mr. Frank Atley (Mogok, Upper Burma); Surgeon-Captain S. H. Burnet, I.M.S (Bombay); Mr. C. B. N. Pelly (Ganjam, Madras); Mr. L. T. Harris

(Vizagapatam) ; Mr. Frederick Lewis, F.L.S. (Ceylon) ; Mr. Narayen Vishvanath Mandlik (Bombay) ; Mr. W. H. Clark (Vizianagram) ; Mr. John F. Jowitt (Ceylon) ; Lieutenant C. W. Keene (Peshawar) ; Lieutenant-Colonel C. W. Ravenshaw (Oodeypore) ; Ven'ble Archdeacon W. E. Scott (Bombay) ; the Hon'ble Meherban Narayenrao Govind *alias* Babasaheb Ghorpade, Chief of Ichalkaranji (Kolhapore); Shrimant Gungadharrao Ganesh *alias* Babasaheb Patwardhan, Chief of Miraj (Miraj) ; Mr. L. Cosserat (Raj-pardi) ; Lieutenant E. C. Harington, R.A. (Bolarum) ; Lieutenant-Colonel W. B. Ferris (Mahikantha) ; and Mr. A. E. F. Morison (Kotagiri).

CONTRIBUTIONS TO THE MUSEUM.

Mr. W. S. Millard, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
1 Skin of the large Brown Flying Squirrel.	*Pteromys oral*	Lieut. J. H. Vanderzee.
1 Python, juv. (alive).........	*Python molurus*	Mr. W. C. Clements.
1 Chamæleon (alive).........	*Chamæleon calcaratus*	Mr. C. R. Jeffries.
3 Specimens of Fish.........	*Aspidoparia morar*............	Major R. H. Rattray.
1 Skin of the Crested Serpent Eagle.	*Spilornis cheela*	Capt. P. Z. Cox.
1 Skin of the Indian Pitta.	*Pitta brachyura*................	Do.
1 Snake	*Callophis nigrescens*	Mr. A. M. Kinloch.
1 Skin of the Black-crested Baza.	*Baza lophotes*	Capt. H. C. Copeman.
2 Snakes	*Gongylophis conicus* and *Tropidonotus stolatus*......	Surg.-Capt. G. Birdwood.
1 Black Cobra (alive).........	*Naja tripudians*	Mr. W. C. Clements.
1 Phoorsa	*Echis carinata*.................	Mr. H. Bulkley.
Some Scorpions and Centipedes.	....	Do.
1 Snake (alive)..................	*Lycodon aulicus*	Mr. W. C. Clements.
1 Snake...........................	*Simotes arnensis*	Mr. J. P. Brand.
1 Botanical Cabinet..........	....	Presented by Mr. G. M. Woodrow.
1 Crocodile, juv. (alive)......	*Crocodilus palustris*...........	Lieut. K. E. Nangle.
1 Tiger's Skull.................	*Felis tigris*	Do.
1 Shama (alive)................	*Cittocincla macrura*	Major. W. J. Bythell, R. E.
2 Eggs of the Himalayan Snow-Cock.	*Tetraogallus himalayensis* .	Capt. A. MacMahon, C. S. I., C. I. E.
1 Photograph of large Sind Ibex.—(Length of horns, 55½ in.)	*Capra ægagrus*	Mr. J. Strip.
1 Chamæleon (alive)........ .	*Chamæleon calcaratus*.........	Mr. W. Shipp.
1 Pair Chinkara horns, male (11¾ in.).	*Gazella bennetti*	Lieut.-Col. C. W. Ravenshaw.
1 Pair Chinkara horns, male (11 in.).		
1 Pair Chinkara horns, male (10½ in.).		
1 Pair Chinkara horns, male (10½ in.)		
1 Pair Chinkara horns, female (5 in.).		

Contribution.	Description.	Contributor.
Some specimens of Fishes from Aden and Persian Gulf.	*Exocetus evolans*	Dr. P. W. Bassett-Smith, R.N.
	Serranus stoliczai	
	Lutjanus johni	
	Lutjanus lunulatus	
	Scolopsis vesmeri	
	Balistes viridescens	
	Electris sp.	
	Litorina sp.	
1 Snake	*Lycodon aulicus*	Mr. G. H. Townsend.
Eggs of the Indian Bustard and Lesser Florican.	*Eupodotus edwardsi* *Sypheotides aurita*	Mr. A. H. A. Simcox, I.C.S.
1 Chamæleon (alive)	*Chamæleon calcaratus*	Mr. F. A. G. Simpson.
1 Earth Snake (alive)	*Silybura macrolepis*	Mr. J. Cunningham.
1 Lizard (alive)	*Hemidactylus triedrus*	Mr. F. Dundas Whiffin.
1 White-winged Grosbeak	*Pycnorhamphus carneipes*	Major R. H. Rattray.
2 Specimens of Fish	*Oreinus ginuatus*	Col. T. Freeman.
3 Black Cobras (alive)	*Naja tripudians*	Mr. W. C. Clements.
7 Snakes	*Zamenis gracilis*	Capt. C. A. Roosmale Cocq.
	Oligodon subgriseus	
	Dryophis mycterizans	
	Tropidonotus stolatus	
	Silybura brevis	
	Lycodon aulicus	
1 Lizard	*Calotes versicolor*	Do.
1 Indian Monitor	*Varanus bengalensis*	Do.
22 Birds' Skins from Aden.	....	Capt. A. Newnham, F.Z.S.

MINOR CONTRIBUTIONS RECEIVED FROM

Veterinary Major Jas. Mills, Captain H. Wells-Cole, Mr. E. H. Young, Mr. W. Gonsalves, Mr. W. Gaye, Mr. Collett, and Mr. W. P. Cleary.

CONTRIBUTIONS TO THE LIBRARY.

"Nature," Vol. 58, Nos. 1492-1504, from Mr. W. F. Sinclair; The Irish Naturalist, Vol. VII., Nos. 6-8, from Mr. W. F. Sinclair; The Indian Forester, Vol. XXIV., Nos. 6-8; The Agricultural Ledger for 1898, Nos. 1-7; The Canadian Entomologist, Vol. XXX., Nos. 6-8; The Record of the Botanical Survey of India, Vol. I., Nos. 9-11; Year-Book of the United States Department of Agriculture for 1897; Proceedings of the United States National Museum, No. 19; Proceedings of the Academy of Natural Sciences of Philadelphia for 1897-98; The Transactions of the Meriden, Conn., U. S. A. Scientific Association, Vol. VIII. for 1897-98; Bulletin of the Geological Institution of the University of Upsala, Vol. III., Parts 2-6; The Transactions of the South African Philological Society, Vol. IX., Part 2, for 1896-97; The Transactions of the Proceedings of the New Zealand Institute, Vol. XXX., for 1897; Journal of the Asiatic Society of Bengal, Vol. LXVII., Part II., No. 1; The Annual Report of the Working of the Lucknow Provincial Museum for 1898; The Indian Museum Annual Report for 1895-97; Flora de Goa e Savantvadi, by Dr. D. G. Dalgado, from the Author; General

Report of the Geological Survey of India for 1897-98; Report of the Director of the Botanical Survey of India for the Year 1897-98.

PAPERS READ.

The following papers were then read and discussed :—

(1) The Æthiopian Wart Hog (*Phacochœrus æthiopicus*), by Captain P. Z. Cox, F.Z.S., F.R.G.S.

(2) Notes on Wild Fowl in the Tinnevelly District, by Mr. W. N. Fleming.

(3) Does the Brown Bear Hybernate? by Mr. C. Donald.

(4) Hybernation of the Himalayan Black Bear (*Ursus torquatus*), by Major G. S. Rodon.

(5) Birds not recorded from Travancore in the "Fauna of British India—Birds," by Mr. H. S. Ferguson, F.Z.S., F.L.S.

(6) Notes on Sport in Oudh, by Mr. S. Eardley-Wilmot.

(7) Lion Cubs, by Major G. S. Rodon.

(8) Migration of *Euplœa core*, by Mr. E. H. Aitken.

(9) A Brace of Tigers with one Shot, by Mr. A. L. Butler.

(10) Notes on the Caju nut tree (*Anacardium occidentale*) and the various uses which can be made of the fruit and nut, by Dr. J.A. da Gama, L.M., M.A.B.

A vote of thanks was passed to the authors of the various papers, all of which will duly appear in the Society's *Journal*, and the meeting then terminated.

PROCEEDINGS

OF THE MEETING HELD ON 7TH DECEMBER, 1898.

A meeting of the members took place at the Society's Rooms on Wednesday, the 7th December, 1898, Doctor D. Macdonald presiding.

NEW MEMBERS.

The election of the following new members was announced:—Major N. Manders, R. A. M. C. (F. E. S.), Colombo ; Mr. Arthur H. M. Jones (Bombay), Mr. F. M. Mackwood (Colombo), Mr. M. J. Alderson (Kalutara, Ceylon), Dr. Frederick Whyte (Cachar), Mr. W. V. Wallace, I.C.S. (Burma), Mr. W. H. Craddock (Burma), Captain B. E. M. Gurdon, D.S.O. (Chitral), Major C. L. Wilson, R.A. (Murree), Mr. R. W. Hanson (Persian Gulf), Mr. A. Hale (Straits Settlements), Lieutenant J. C. M. Hoskyn (Neemuch), Lieutenant Ernest Barnest (Indore), Mr. S. H. Bergersen (Cachar), Mr. F. H. Vick (Cachar), Mr. F. Hyde-Wilcox (Calcutta), Mr. R.S. Routh (Cachar), Mr. E. St. J. Gebbie (Cachar), Mr. C. B. Holman Hunt (Ceylon), Mr. David A. Macmillan (Orissa), Mr. J. W. W. Danson (Rangoon), Lieutenant J. Dalby, R.A. (Jubbulpore), Colonel J. Duke, I.M.S. (Kashmir). Lieutenant H. M. Butler (Ahmedabad), Mr. Lionel E. Caine (Mombasa), Captain R. G. Burton (Jalna), Mr. R. M. Kennedy, I.C.S. (Bombay), Major F. D. Lumley (Wellington), Lieutenant George H. R. Watts (Kohat), Mr. J. L. MacCarthy O'Leary (Kurnool), and Major E. A. Grubbe (Meerut).

CONTRIBUTIONS TO THE SOCIETY'S MUSEUM.

The Honorary Secretary acknowledged having received the following contributions to the Society's collections since the last meeting:—

Contribution.	Description	Contributor.
2 Snakes (alive)	*Tropidonotus plumbicolor*	Mr. A. M. Kinloch.
1 Tree Mouse (alive)	*Vandeluria oleracea*	Mr. R. Roberts.
1 Earth Snake (alive)	*Gongylophis conicus*	Mr. W. E. Clements.
1 Small Indian Civet (alive)	*Viverricula malaccensis*	Do.
1 Chamæleon (alive)	*Chamæleon calcaratus*	Mr. E. MacDonald.
1 Skin of the Indian Palm Civet.	*Paradoxurus niger*	Mr. J. Dundas Whiffin.
2 Russell's Vipers (alive)	*Vipera russelli*	Mr. S. Armstrong.
Eggs of Spotted Dove	*Turtur suratensis*	Mr. C. Donald.
Eggs of White-cheeked Bulbul.	*Otocompsa leucogenys*	Do.
Skins of Rock Chat	*Monticola saxatilis*	Lieut. W. Beadon.
1 Long-armed Sheath Bat	*Taphozous longimaus*	Capt. W. R. Scroggie, I. S., M. D.
8 Snakes	*Tropidonotus plumbicolor*	Do.
	Dipsas trigonata	Do.
	Bungarus ceruleus	Do.
	Oligodon subgriseus	Do.
1 Phoorsa	*Echis carinata*	Do.
1 Snake	*Zamenis ventrimaculatus*	Lieut-Colonel W. B. Ferris.
1 African Chamæleon (alive)	....	Capt. J. L. Parfitt.
1 Peregrine Falcon (alive).	*Falco peregrinus*	Capt. A. J. Peile, R. A.
1 Grey Lag Goose (alive).	*Anser ferus*	Mr. S. B. Bates.
Photos of Animals	....	Capt. C. E. Williams.
A number of beetles	....	Mr. R. Proctor Sims.
1 Snake	*Dipsas trigonata*	Mr. E. L. Barton.
1 Porcupine Skull	*Hystrix leucura*	Lieut. K. E. Nangle.
1 Grey Hypocollius (alive).	*Hypocolius ampelinus*	Mr. W. D. Cumming.
1 Sarus Crane (alive)	*Grus antigone*	Mr. C. Merrony.
1 Chamæleon (alive)	*Chamæleon calcaratus*	Do.
Nest and Eggs of the common Wren Warbler.	*Prinia inornata*	Mr. A. H. Simcox, I.C.S.
1 Panther cub (alive)	*Felis pardus*	Mr. W. H. Wolff, C.E.
1 Crimson-breasted Barbet (alive).	*Zantholæma hæmacephala*	Mr. G. Phillips.
2 Lizards (alive)	*Charasia ornata*	Mr. C. Merrony.
Nests of Paradise Fly-catcher and Golden Oriole.	....	Major K. A. Dunsterville.
1 Eastern Ballon's Crake (alive).	*Prozana pusilla*	Mr. J. P. Brand.
Eggs of India monitor.	*Varanus bengalensis*	Mr. G. K. Wasey.
14 Nests of the Common weaver bird on a single palm leaf.	*Ploceus baya*	Mr. Isaac Benjamin.
1 Sand snake	*Eryx johnii*	Mr. C. Hudson, I.C.S.
Spiders and Scorpions	....	Mr. T. N. Hearsey.
2 Chamæleons (alive)	*Chamæleon calcaratus*	Mr. E. MacDonald.
A collection of sea shells from the Gulf of Aden.	....	Capt. P. Z. Cox.
Skin of Common Starling	*Sturnus menzbieri*	Mr. H. Bulkley.
1 Fœtal monstrosity	*Capra hircus*	Major V. Harrington, I.M.S.

CONTRIBUTIONS TO THE LIBRARY.

List of Bombay Grasses and their uses, from Government; Catalogue of the Fishes in the British Museum (second edition), Vol. I, from Government; Anales del Museo Nacional de Montevideo; Nature, Vol. 58, Nos. 1505-1513, from Mr. W. F. Sinclair; Irish Naturalist, Vol. VII., Nos. 9 and 10, from Mr. Sinclair; Indian Forester, Vol. XXIV, Nos. 9 and 10, in exchange; Canadian Entomologist, Vol. XXX. Nos. 9, 10, 11; Agricultural Ledger, Nos. 9, 10, 11, 12, from Government; A Manual of the Geology of India, Part I., from Government; Annals and Magazine of Natural History; Vol. II. Nos. 9, 10; Annuaire du Musée Zoologique de l'Académie Imperiale des Sciènces de St. Petersbourg, 1898, No. 1; Illustrations of the Zoology of R. I. M. S. Investigator, from Government.

FISHING IN BOMBAY WATERS.

Mr. F. O. Gadsden read an interesting paper on this subject, describing his experiences with the well-known sporting fish the " Bahmin " (*Polynemus tetradactylus*) in Bombay Harbour.

BOMBAY RATS.

A short paper received from Mr. E. H. Aitken on the different species and sub-species of rats to be found in Bombay was read and discussed. Mr. Aitken dealt upon the conspicuous part played by rats during the present epidemic, and pointed out the importance of acquiring a thorough knowledge of the different species which inhabit the city.

BULL-TERRIER AND TIGER.

Captain R. G. Burton of the Hyderabad Contingent contributed a graphic description of the excitement caused by the sudden appearance of a tiger in the Cantonment of Jalna on the 18th ultimo about five o'clock while the band was playing. As there are no forests or heavy jungles within fifty miles of the station the presence of such an animal in the bungalow gardens was, to say the least, unexpected. The important part played by a bull-terrier, in driving the tiger out of cover and attacking it, formed an interesting feature of an exciting episode, which ended with the destruction of the tiger, but not before it had killed one man and mauled another.

NEW OR RARE TREES.

Mr. T. F. Bourdillon, F.L.S., Conservator of Forests, contributed an important paper describing six trees, which he had found in Travancore, five of which appeared to be new. Excellent drawings of these trees were exhibited, and will be reproduced in the Society's Journal when the paper is published.

MISCELLANEOUS NOTES.

The following short papers were also read:—*a* White Spots on the Plumage of a Woodpecker attacked by Parasites, by A. L. Butler; *b.* A Voracious Centipede, by Captain H. Wells-Cole; *c.* Breeding of the Black-breasted Honeysucker in the Cachar District, by C. M. Inglis; *d.* Parasitic Worms in Fish, by Major R. H. Rattray; *e.* On the Nidification of the White-Necked Stork, by C. M. Inglis; *f.* On Nests and Eggs found in the vicinity of Baroda, by Captain R. M. Betham; *g.* Elephant's Ankle Joints, by W. F. Sinclair; *h.* Nesting of the Red-tailed Chat, by Major R. H. Rattray; *i.* Curious conduct of a Panther, by Lieutenant C. D. Lester.

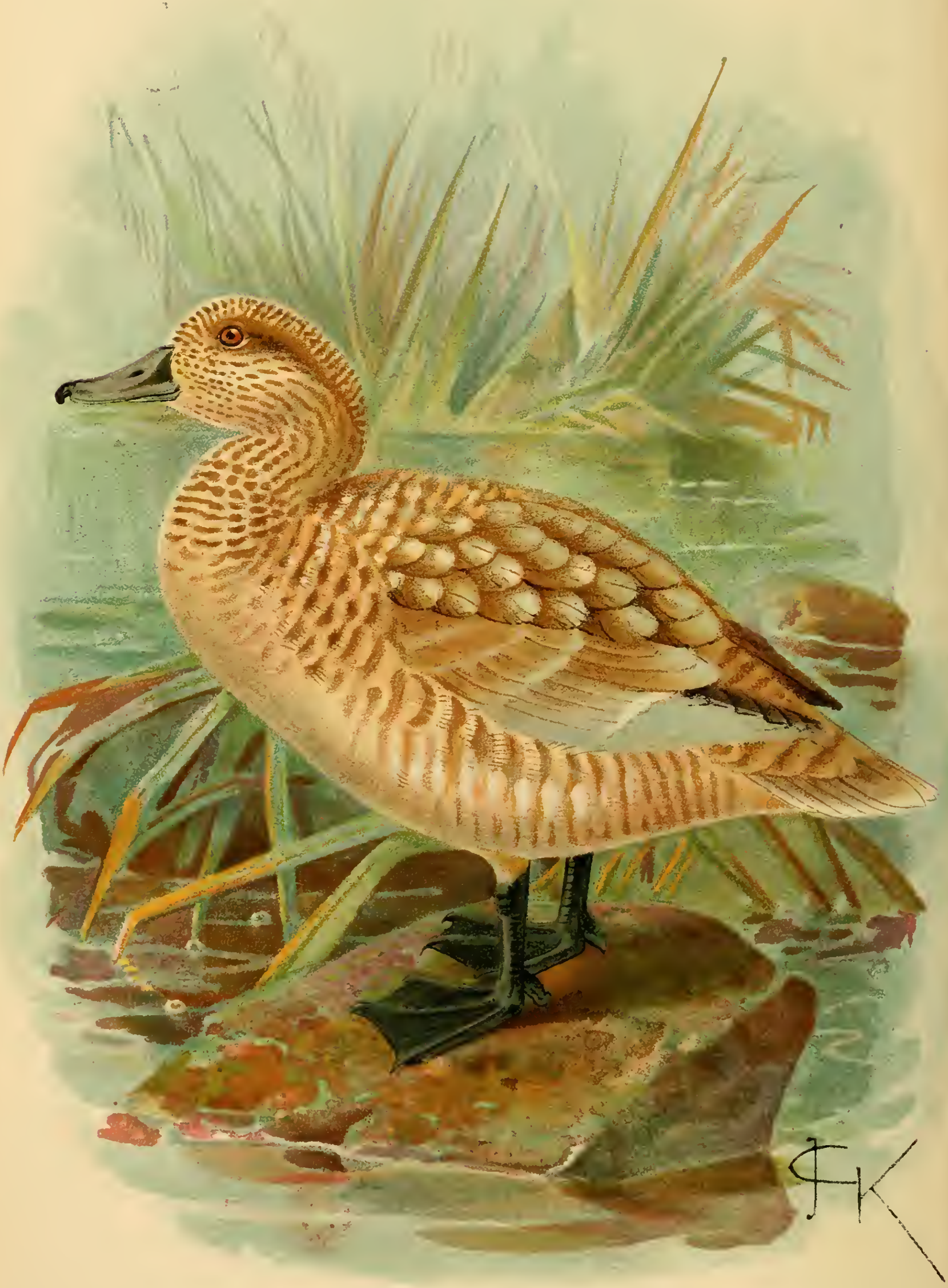
THE SOCIETY'S JOURNAL.

Mr. H. M. Phipson stated that the publication of the Society's Journal had been unavoidably delayed owing to the non-receipt of proofs from Contributors in Europe, but that Parts No. 5 of Vol. XI and No. 1 of Vol. XII were now being printed off and would be issued to members in the course of a few days.

FLORA OF BOMBAY.

The honorary secretary announced that Mr. G. Marshall Woodrow, of the College of Science, Poona, had now placed in the Society's herbarium a complete collection of the plants of Bombay, and had also presented to the Society a cabinet to contain the same. A special vote of thanks was passed to Mr. Woodrow for his valuable contribution.

MB



J G. Keulemans del.		Mintern Bros Chromo lith London.

THE MARBLED TEAL.

Marmaronetta angustirostris.

2/5 Nat size

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JOURNAL

OF THE

BOMBAY

Natural History Society.

Vol. XII. BOMBAY. No. 3.

INDIAN DUCKS AND THEIR ALLIES.

By E. C. Stuart Baker, F.Z.S.

Part VII, with Plate VII.

(*Continued from page* 261.)

Genus Dafila.

The general appearance of the genus Dafila is more elongate than any other of our Indian Ducks, in both sexes the tail is pointed and that of the male has the central rectrices considerably lengthened, when in good plumage. The bill is slightly wider at the end than at the base.

Of the five species of Dafila, India has but one, the very widespread species—*D. acuta*. The genus is almost cosmopolitan, Australia alone being unrepresented by any form.

(27) Dafila acuta.

The Pintail.

Anas acuta, Legge, " Birds of Ceylon," p. 1096.

Dafila acuta, Jerdon, " Birds of India," III, p. 803; Hume, " Str. Feath.," I, p. 261 ; Adams, *ibid*, II, p. 338 ; Hume, *ibid*, III, p. 193; Butler, *ibid*, IV, p. 29 ; Hume and Davison, *ibid*, VI, p. 489 ; Ball, *ibid*, VII, p. 232 ; Cripps, *ibid*, p. 312 ; Hume, *ibid*, p. 412 ; *id.*, *ibid*, VIII, p. 115 ; *ibid*, Cat. No. 962 ; Scully, "Str. Feath.," VIII, p. 362 ; Hume and Marshall, " Game Birds of India," III, p. 189 ; Vidal, " Str. Feath.," IX, p. 92 ; Butler, *ibid*, p. 438 ; Reid, *ibid*, p. 82 ;

ibid, p. 245; *id.* "Birds of British Burma," II, p. 298; Barnes, "Birds of Bombay," p. 407; Hume, "Str. Feath.," XI, p. 345; Salvadori, Cat. "Birds of British Museum," XXVII, p. 270; Blanford "Avifauna—Birds of India," IV, p. 447.

Description: *Adult Male.*—Whole head brown, varying from a rather pale dingy to a rich dark umber, glossed on the upper parts with purple or copper, more especially on the sides of the sinciput and nape; chin and throat sometimes rather paler than the upper parts; nape almost black, grading on the one hand into the rich brown of the head and on the other into the grey of the hind-neck; the grey of the hind neck, formed by the most minute stipplings of brown and pale grey gradually changing into the more pronounced stipplings and bars of the upper plumage, which retain the same colours; a white band on either side of the nape joining the white of the neck; rump like the back; upper tail coverts black, edged grey; neck and breast white; abdomen the same but more or less stippled with grey on the lower parts; flanks and sides like back. Longer scapulars velvety black edged with silver grey; shorter scapulars like the back but often with dark centres; wing coverts brownish-grey, the greater tipped with rufous chestnut; secondaries forming the speculum bronze green, tipped white, sub tipped black, the feather next the speculum black, on the outer web narrowly tipped white and with a line of the same next the quill, inner web brownish-grey; remaining inner secondaries grey on the outer web, black edged with grey on the inner webs. The central rectrices black, the other rectrices grey-brown; lower tail coverts black except the ulterior ones, which are white; the flanks next the tail coverts are white, more or less tinged buff and with vermiculations fainter than those on the rest of the flanks.

Length about 26″ depending on length of tail feathers, which vary from 4·5″ to full length; central rectrices 9″ long; wing 10·5″ to 11·5″, tarsus 1·5″ to 1·75″; bill from gape and from front about 2·25″.

"Length of male 22″ to 29″; tail 5″ to 8·5″; wing 11, tarsus 1·6″; bill from gape 2·25″" (Blanford).

"The drake moults all feathers except the primaries, secondaries wing coverts and six pairs of outer rectrices at the end of June, and assumes plumage very like that of the female, the usual male plumage being resumed by a complete moult in October" (Blanford).

" Expanse 32·0″ to 37·75″ ; wing 10·3″ to 11·75 ; tail from vent 4·8″ to 9·4 ; tarsus 1·5″ to 1·8″, bill from gape 2·0″ to 2·4″ ; weight 1 lb. 10 ozs. to 2 lbs. 12 ozs." (Hume).

Irides dark brown, often tinged reddish ; bill light to dark plumbeous, the culmen, lower mandible and base darker, almost black. Legs and feet dark plumbeous grey or blackish ; webs, claws and joints darker.

" In the adult male the bill is plumbeous, light plumbeous or lavender blue, with the entire lower mandible a broad band along the entire culmen, the angle at the base of the upper mandible, and a strip along the margin of its terminal half, black.

" In some apparently adult males I have noted the feet as brownish-black, blackish-grey, and uniform dusky" (Hume).

" Legs blue ; irides brown, bill black, blue at sides" (Vidal).

" Legs very pale yellowish flesh color, variegated with shades of purplish brown, darker tint of last on the nail and web membranes" (Swinhoe).

Female.—Head brownish-buff with dark centres to the feathers ; throat and chin pale ; neck the same, speckled brown, upper parts brown, the feathers edged white, or buffy-white and scapulars with a few bars of the same ; the white tips of the greater secondaries and greater coverts form two distinct bars, but there is no speculum ; quills dark brown, the inner ones narrowly edged white and all paler on the inner webs; lower parts dingy white more or less tinged buff or even rufous and streaked and centred brown.

Irides brown, bill and legs like the male but duller and, as far as I know, the bill never has a blue tinge. I have one female with a distinctly orange tinge to her legs, shewing as a sort of mottling on the shanks.

Length about 20″ ; wing 9·75″ to 10·25″ ; tarsus about 1·5″ ; tail about 4″ to 5·25″ ; bill at front 2·0″ to 2·1″ from gape about the same.

" Length 20″ to 22·5″ ; wing 9·3″ to 10·2″ ; tail from vent 4·2″ to 5·5″ ; tarsus 1·45″ to 1·7″ ; bill from gape 2·1″ to 2·35″, weight 1lb. 2ozs. to 1lb. 14ozs." (Hume).

Young Male.—Has the wing like that of the adult, but is otherwise coloured like the female. The first male plumage to be assumed is that of the back which may often be seen in a transition state, between the mottled coloration of the female and the fine stippling of the male; the lower plumage is the next to change, though the broad mottled plumage of the lower flanks is often retained for some time and finally the dark head and white neck of the adult male is assumed.

Young females are very thickly speckled and mottled on the lower surface.

Young birds of both sexes appear to have legs and bills a uniform-dark dusky.

"*Young in down* have the same pale spots on the upper parts as those of the Mallard, but the white on the throat and belly is slightly suffused with grey instead of buff, and in addition to the dark line passing through the eye, a second line passes from the lores below the eye to the nape" (Seebohm).

Salvadori gives the habitat thus: " Northern Hemisphere, breeding in the Northern parts and migrating Southwards to Northern Africa, India, Ceylon, China, and Japan and in America as far as Panama and Cuba."

There is practically no portion of the Indian Empire which the Pintail does not visit, Hume excluded it from South Tenasserim, but it has now been recorded thence more than once though it appears to be very rare there. Davidson reported it as rare in the Deccan (some writers have found it less rare than he did), and Vidal says: "Pintails are to be seen in some years in small parties in the large Duck ground at the junction of the Vashishti and Fagbudi rivers (South Konkan), but they come late and go early."

Taken all round the Pintail is one of the most common of Indian ducks, occurring sometimes in huge flocks but more often in such as number forty to sixty individuals. It is but rarely very small flocks are seen and solitary birds or pairs hardly ever.

Where they are least common, flocks of only twenty or so may be met with frequently, but this is about the minimum number. As regards the maximum number, it is hard to give figures, but Hume talks of thousands in a flock; other writers of many hundreds. I have myself, both in Bengal and Assam, seen flocks which must have contained three to five hundred birds, although such are not of common occurrence. G. Reid in his " Birds of the Lucknow Civil Division"

(" Str. Feath.") speaks of them being " generally met with in immense numbers," but he does not define what he means by immense.

Most sportsmen would place the Pintail before all other Ducks. As a rule they are extremely shy, wary birds and are very hard to approach within gun shot, but one or two people have found them to be quite the contrary ! Captain Baldwin says that he found it an easy bird to approach even when feeding on open pieces of water. This is somewhat confirmed by the fact that in Cachar the natives tell me that they can get at Pintails far more easily than at other ducks, and it is true that they *do* bring in more Pintails in proportion than they do Gadwalls, Teal, etc. ; at the same time I have personally found them to be the hardest to get at of all the ducks, and such of my friends as have given me their experience have found the same.

In the day time they frequent large lakes and jheels and rest in the centre of wide, comparatively open pieces of water shunning such as have thick cover of reeds or similar heavy jungle, yet resorting always to those which have the surface covered with lilies and the smaller water plants, amongst which they can lie, well concealed yet able to discern at once the approach of anything to their vicinity. During the night—they do not leave their day quarters until very late—they visit the smaller jheels and tanks, the rushy banks of nullahs and canals and similar places where they feed, but the first glimmer of dawn finds them on the wing once more *en route* to the larger waters. Big rivers they do not seem to like; all down the Surma Valley the Pintail is very common, but though found in numbers on the vast expanses of water, quite close to the Barak, Surma, Megna, etc., and often seen evening and morning crossing the river high up out of range, yet I have never heard of their haunting any of these rivers.

In the same way I believe they are practically non-existent on the Ganges, Indus and other large rivers. Small rivers, if of clear and quick running waters, are no more pleasing to the Pintail, but small creeks of almost still water, canals which have vegetation about them, are visited for the purpose of food and occasionally a flock may be put up from such places in the day time.

Their food seems mainly to consist of small and fragile shellfish, but they also eat a large variety of other animal matter, and also are to a certain extent vegetarians. Unlike, however, the majority of the ducks, which are more animal than vegetable feeders, the Pintail is amongst the very best of birds for the table. Sometimes, it is said, it becomes rank, fishy and almost uneatable, but as a rule it is excellent and *nearly* always good.

Many others must have noted the peculiarity of the Pintail to which Hume alludes. He writes : " It is worth noting because it is a peculiarity almost confined to this species that during the cold season one continually comes across large flocks consisting entirely of males. I cannot say that I have ever noticed similar flocks of females ; but this may be because the females do not attract the eye similarly, and are not equally readily discriminated at a distance, but ' bull picnics ' I have noted times without number, as a specialty of the Pintail."

They are decidedly good swimmers, sitting light and very high on the water, their long necks and rather raised tails giving them a very graceful appearance ; as divers, however, they are failures, they cannot stay any time under water nor can I find any observer giving them credit for being-able to hide under water, amongst the weeds, or of holding on to submerged weeds, etc., with their feet. Getting off the water they are less quick than some ducks, " skittering " along the surface for a few feet ; they rise less abruptly also, but once on the wing they shew to the greatest advantage ; their flight is exceedingly swift, probably faster than that of any other duck, and is very easily recognizable. They fly in very regular formation, changing position less than do most ducks and when close to the hearer the sound of their flight is quite unmistakable. Less noisy and whirring than that of most of their near relations, their flight has a soft swish, swish about it of a very distinctive character. Hume says, speaking of their flight, that it is a " low, soft, hissing swish " and this describes it very exactly. Their voice is like that of the Mallard a distinct quack, but is far softer and also less loud than that of the Mallard, Gadwall or Spot bill ; they are, however, silent birds and one seldom hears them emit any other sound beyond the low colloquial chuckle they sometimes indulge in when resting. I have not heard them calling when on the wing, except when about to settle or just after rising or when suddenly frightened by a shot or other cause.

On the land they walk easily but slowly, as might be expected from their configuration, nor will they often be found resorting to it though Hume records having seen them on the land.

In the autumn the male bird assumes a plumage similar to that of the female, but can of course always be distinguished at a glance by the presence of the speculum which is wanting in the female. Hume says that he has never obtained any birds in this stage of plumage in India, but in my very small series I have two and have seen several others.

Yarrel, speaking of this change of plumage, says that it commences in July and is affected partly by change of plumage and partly by actual change of colouration in the feathers. As regards the reassumption of the male plumage he says : "At the annual autumn moult the males again assume with their new plumage the colours peculiar to their sex, but the assumption is gradual. White spots first appear among the brown feathers on the front of the neck, by the end of the second week in October the front of the neck and breast is mottled with brown and white ; at the end of the third week in October a few brown spots only remain on the white."

Both my birds were obtained in the third week of October, and are in the plumage ascribed by Yarrel to that of the second week, the heads are entirely like those of the female.

The breeding range of the Pintail is practically that of the Gadwall, but it reaches further north, and on the other hand does not reach so far south, for whereas the Gadwall breeds as far south as the 46th degree, Hume places the limit for the Pintail 10 degrees higher up. It breeds in Northern Europe and eggs and young have been found in the north of the British Isles themselves, and extends thence throughout Northern Asia.

The nest is a rather rough, loose structure of grasses, flags, rushes and similar material, lined, not very thickly as a rule, with down and feathers, and the eggs are generally laid in early May, though the date depends a great deal on locality ; in its southern limits the eggs may be laid as early as the end of April and in its northern from April to August. During the breeding season, *i.e.*, April to August, the Pintail haunts swamps and marshes which are more or less covered with vegetation ; the pools, such as there are of open water, being confined to patches here and there, surrounded with bush, forest or other cover. Open waters such as lakes, rivers or similar pieces of water it avoids altogether, nor is it any use hunting the banks and margins of such for the nests which will almost invariably be found in the places first mentioned.

Morris in "Nests and Eggs of British Birds" says: "Of this species also, the nest is placed by the margin of, or at no great distance from, water, lakes, ponds, and seas, and is composed of grass and reeds, with a little lining of down. Some have been found in ditches and even in standing corn ; it is always well concealed.

"These ducks pair in April.

"From six to eight or nine eggs are laid. The young are hatched in about twenty-three days. They at once repair to the water."

The nest is usually well concealed amidst the scrub and coarse weeds and grass and takes a considerable amount of searching to discover, but the duck sits very close and often rises at one's feet almost, thus disclosing the position which might otherwise escape detection.

The eggs vary from six to ten in number being usually six to eight and occasionally only five are laid.

In colour they are a dull pale greenish stone colour, in a few, yellowish stone, but all dull and all pale with no very definite colour such as some ducks' eggs have. There is a slight gloss, sometimes rather pronounced, and I have seen none entirely glossless. The texture is extremely fine and close and the shell perhaps rather thinner in proportion to the size of the eggs than are the majority of eggs of the *Anatinæ.*

My eggs seem to average rather large ; I have a clutch given me by Herr. M. Kuschel, and collected, I believe, in East Prussia, which averages 2·24″ × 1·6″, the biggest is 2·27″ × 1·62″. A number of other eggs I have measured have been well over 2·20″ and I have seen none under 2·1″.

The eggs collected in Finland both by Wolley and Dresser had their measurements recorded as 2″ × 1·5″, but the eggs collected by the latter in Jutland measured 2·22″ × 1·4″.

Genus QUERQUEDULA.

The distinctive feature of the Genus *Querquedula* is the bright blue-grey colour of the wing coverts which in two species, *Discors* and *Cyanoptera,* are a bright smalt blue. The Common Teal, *Nettion crecca*, used to be placed in this genus, but *Nettion* differs from *Querquedula* in the shape of the bill, which is equal in breadth throughout its length, whereas in the latter it is slightly broader at the tip and also has the nail somewhat larger in proportion.

The internal structure is also different, the labyrinth of the trachea being differently formed, being enlarged on both sides downwards in *Querquedula* but on one side only and upwards in *Nettion.*

There are five species of which four are confined to America, the fifth alone visiting India in winter. All five are birds of much the same size.

(28) QUERQUEDULA CIRCIA.

The Garganey or Blue-wing Teal.

Anas circia, Legge, " Birds of Ceylon," p. 1080.

Querquedula circia, Jerdon, " Birds of India," III, p. 807 ; Hume, "Nests and Eggs," p. 644; Hume, "Str. Feath.," I, p. 202 ; Adam, *ibid,* p. 402 ; Hume, *ibid,* III, p. 193 ; LeMes, *ibid,* p. 382 ; Butler, *ibid,* IV, p. 30 ; Scully, *ibid,* p. 201 ; Butler, *ibid,* V, p. 234 ; Hume and Davison, *ibid,* VI, p. 489 ; Butler, VII, p. 188 ; Ball, *ibid,* p. 232 ; Cripps, *ibid,* p. 312 ; Hume, *ibid,* p. 494 ; *id.,* Cat. No. 965 ; " Str. Feath.," VIII, p. 115 ; Scully, *ibid,* p. 363 ; Hume and Marshall, " Game Birds of India," III, p 215 ; Vidal, " Str. Feath.," IX, p. 93; Butler,*ibid,* p. 438 ; Reid, *ibid,* p. 83 ; Hume, *ibid,* p. 418 ; Oates, "Birds of British Burmah," II, p. 286 ; Barnes, " Birds of Bombay," p. 410 ; Hume, " Str. Feath.," XI, p. 346 ; *id.* " Nests and Eggs," (Oate's edition), III, p.291; Salvadori, Cat. "Birds of British Museum," XXVII, p. 293 ; Blanford, Avifauna, IV, p. 449.

Description : Adult Male.—Crown and nape deep brown, lighter on the forehead, where it is more or less streaked with white, and sometimes with a faint gloss at the sides. A broad superciliary stripe from in front of the eye down the sides of the nape white ; chin black ; remainder of the head and neck rich bright chocolate streaked with white ; back, rump, upper tail coverts and tail brown, the feathers all edged paler or greyish-brown, inner scapulars black glossed green with broad wide central streaks and narrow white margins, outer scapulars the same but with the outer webs broadly blue-grey ; wing coverts bright pale french-grey, the greater ones broadly edged white forming a wing bar ; outer secondaries brown-grey glossed green and tipped white ; quills brown, the inner primaries greyish broadly edged greyish white ; breast brown with black or dark brown markings, concentric on the upper breast, in the form of bars on the lower breast, gradually changing one into the other ;

abdomen white more or less speckled with brown towards the vent; thigh coverts brown and white; flanks white, finely barred with black, the feathers nearest the tail with two broad bars of white and grey divided by a narrower black line; under tail coverts white, or buffy-white, the shorter with brown drops. Under wing coverts mainly dark grey, the central ones and axillaries white.

Irides dark brown, bill brownish-black, nail black, margins of maxilla and lower mandible paler; legs and feet dark grey.

I have a bird which had the feet bright orange, this must be something very unusual.

"In the adult male the bill is normally blackish above, brownish on the lower mandible, except at the tip, often reddish-brown at the gape."

"The legs and feet are grey, pale greenish-brown, grey with an olive shade, grey slate colour, purplish slate colour, bluish.........in all cases the webs being more or less dusky and the claws darker still." (Hume.)

Length 15″ to 17″; tail about 2·8″; wing 7·6″ to 8·0″; tarsus 1″ to 1·2″, bill from gape 1·8″.

"Length 15·9″ to 16·25″; expanse 25″ to 27·25″; wing 7·4″ to 8·1″; tail from vent 3·3″ to 3·8″; tarsus 1″ to 1·3″; bill from gape 1·75″ to 1·92″; weight 10 ozs., to 1lb. (commonly about 13 ozs.)." (Hume.)

Width of bill at gape ·52 " at tip ·62".

Female.—Above dark brown, all the feathers with pale margins except the crown, which is rather richer than elsewhere and centered darker; chin and throat white; neck greyish or buffy-white with all the feathers minutely streaked with dark brown; a superciliary stripe from above the eye and a spot on the front of the lores white or buffy-white; wings greyish-brown, in old females more grey, especially on the smaller coverts; speculum as in the male but very blurred and indistinct; fore-neck and upper breast dark brown with broad pale edges to the feathers, lower breast, abdomen and vent white, buffy-white or buff; the flanks, sides and under tail coverts the same splotched, barred and spotted with brown.

Colours of soft parts the same as in the male.

"In some females the bill is similar" (to the males), "in some apparently adult, it is blackish plumbeous above, dull plumbeous below" (Hume.)

Length about 15″; wing about 7·25″; tail 2·6″; bill from gape 1·7″: tarsus 1″; bill at base ·51″ broad, at tip ·60″.

"Length 14·8″ to 15·5″; expanse 23·0″ to 25·5″; wing 7″ to 7·3″; tail from vent 2·9″ to 3·5″; tarsus 1·0″ to 1·15″; bill from gape 1·7″ to 1·85″; weight 9 ozs. to 14·75 ozs. (commonly about 12 ozs.)" (Hume.)

I have a female in my collection which weighed 1 lb. 1 oz. and has a wing of 7·65″.

The young males are similar to the female but are darker, have more brown on the under parts, the speculum is more defined and the coverts a purer grey.

Males in moulting, or post nuptial plumage resemble the females, but have the wing, not the scapulars and innermost secondaries, of the usual colour.

"*The downy nestling* resembles that of the Mallard, but is smaller and has a broad unbroken buff streak above the eye and a well-defined dark streak through the eye" (Yarrell).

The general habitat of the Garganey may be said to be the Palæartic Region, an Eastern not Western form; it has been obtained in North America and Greenland but its home is Northern Europe and Asia in the summer and Southern Europe, Northern Africa, as far south as Shoa and Somali land, and south Asia in the cold weather.

Outside India in the winter it is found throughout Southern Europe and Northern Africa, very common in Egypt through Asia Minor and Arabia, Persia, Afghanistan, Southern China, Japan, the Philippines, Borneo, Java, etc.

In Japan Seebohm says: "The Garganey is a winter visitant to all the Japanese Islands, but appears to be nowhere common." Hose and Everett both obtained specimens in the Bornean Islands, but it would appear to be a rare straggler there.

In India it occurs practically everywhere from the extreme north to the extreme south. As regards its distribution in Ceylon, Legge says: "Found in the extreme north in the Jaffna peninsular, on the swamps of the island of Delft, and on the West Coast down to Manaar in the cool season from November to March. Layard speaks of its occurring in "vast flocks at the head of the Jaffna estuary; but I do not think it is so common nowadays."

It extends throughout Burmah, but is absent in certain portions. Hume says that it is not obtained in Tennasserim, but it has now been frequently recorded thence. It is common in parts between the Sithaug and Salween and extends west of the former river. It does occur in Cashmere and has been, since Hume wrote "Stray Feathers," recorded from that state on various occasions.

It would seem that in the extreme North and North-West the Garganey is perhaps the earliest of the ducks to arrive in India, but further East it is quite a toss up as to whether the Common Teal or the Garganey first puts in an appearance; on the whole I should think the Common Teal is the earlier of the two.

Even in the West the Garganey is not always the first, the Common Teal being sometimes the first recorded.

It is very noticeable that, though in migrating South the birds once in India take long to work further down the Peninsular, yet they work North very speedily.

In Northern India they arrive in September, but according to Theobald and others they do not get to Southern India before December. Leaving, however, they delay until March and April much the same time 'that they leave all portions of their winter home, though everywhere a few stay through May and even into June.

As regards the numbers they arrive in, Hume's note on his enormous bag at one time shews what may be sometimes seen. He writes: "I have a special note of having found a flock which I estimated to contain twenty thousand individuals at Rahun in the Etawah district, on the 28th of August 1865. Never before or since have I seen so huge a body of fowl of one kind, and I have noted that I have bagged forty-seven of them, besides losing at the time many wounded birds (I had no dogs with me) in the rushes. I had sent my gun punt (built exactly on the lines of one of our Norfolk boats) a few days previously out there to see that it was all right for the coming season, and I had taken with me a small but heavy Monghyr made swivel gun carrying only 8 ozs. to try. To my surprise I found the thickest body of fowl on the open part of the jhil I had ever seen. I loaded the swivel with No. 4 shot and worked up quite close to some of them, and within some fifty yards of the main body, when seeing they were all about to start, I fired and knocked over at least sixty, I actually secured forty seven.

This was thirty-five years ago and I fear that flocks like this one are things of the past though they may now and then be met with in very vast flocks. All through the Sunderbunds and again on the Chilka lake they are often to be seen in flocks of thousands, and in Oudh, the North-West and Scinde such flocks are by no means rare.

As a rule over most of its North and North-Western range the flock may roughly be said to average somewhere about and between one to two hundred. To the East, I think, they average smaller and would put it somewhere between fifty and a hundred. Small flocks of five or six or even ten or twelve áre not, I think, at all commonly met with while pairs and single individuals are hardly ever seen.

The Garganey haunts almost any kind of water, not *as a rule* frequenting small quick running streams or small clean tanks and ponds, and being specially partial to wide stretches of fen or bheel, well covered over their greater extent with weeds, yet having fairly extensive patches of clear water dotted here and there over their surface.

During the day they keep almost entirely to the larger sheets of water or, sometimes, to the large rivers, such as Indus, Ganges, etc., where they float in the centre in dense closely packed masses. This manner of packing is very characteristic of the Garganey and they keep more closely together than does almost any other kind of duck; even when flying they do not straggle much.

They feed in the smaller tanks and jhils and also in the paddy fields and on various young land crops. Hume says that in some parts of India they visit the paddy fields in such numbers that on one visit *acres* of paddy are destroyed. Their staple diet is vegetarian and of vegetable matter, the staple articles are rice, both cultivated and wild and the young leaves and shoots of various water plants. They also eat various kinds of reeds, roots, etc., and such animal matter in the shape of worms, snails and shellfish, etc., which force themselves on their notice.

Hume describes well the sound of their flight thus : "Whether it is only because one habitually meets them in such large flocks or whether it is really peculiar to them, I do not know, but certainly one associates the overhead flight of this species with a surging hiss, more even, sustained and rushing than that of any of our other ducks. Any one who has stood under heavy round shot fire knows the way in which shot hurtle up to you crescendo, and die away as they pass ; and just in this way (though the sounds are in a wholly different key) does the swish of a large flock of Garganey surge up to you in the middle of the night, and die away as they pass."

I do not think that it is because the birds are numerous or familiar that we think the sound distinct from that made by other birds' flight. I remember when first introduced to the Garganey how I was struck with the pattering swish of their flight and then noticed how like a whistle it rose and fell as it approached and vanished. Their flight is but little, if at all, inferior to that of the Common Teal though more direct, the flights seldom indulging in the swift dodgings and swervings of that bird. Shooting over the vast Jessore bheels in boats, which went in a thinly scattered line through them, the difference between the flight of the two species was well shown. The Garganeys rose far ahead, swept round but once in a wide semi-circle and then went straight ahead, whereas the Common Teal often dodged in and out down the whole line, circled about two, three or more times and then disappeared but often only to settle half a mile or so further on. The Garganey also rose quicker off the water, getting up obliquely and were quicker away ; again when wounded they swam faster than the common Teal and though by no means first class divers yet they were good enough to be able often to escape us.

As to whether they are wild or tame, opinions seem to differ very much. Theobald says: "They are not very hard to shoot and are easily approached behind a small screen of green boughs. Sometimes a paper kite, made in the shape of a hawk, and flown over the tanks, keeps the Teal together and they will not leave the tank though fired at often." Dresser talking of the Garganey in Europe and quoting Baron Droste actually says : "They are very tame and soon get accustomed to the sight of human beings." Reed says that they are shy and wild when they first arrive (in Lucknow) but afterwards become tamer. Hume says that they are never tame and generally decidedly wild.

As far as my expereince goes I have found that the Garganey is one of the wildest of the duck tribe. Even behind screens, etc., they seem to be very cute and to be able to discern what comes behind the screen quicker than many others of their kind and they are not slow to profit by what they can discern.

Then too they keep much to fairly open water when resting and the sudden appearance of a detached clump of weeds floating towards them at once puts them on the *qui vive* long before the clump gets within shooting distance two out of three times, they leave for safer abodes.

I once, however, came on a flock of these little birds who stuck more persistently to their ground, or water, than any other flock of ducks it has been my fortune to meet. This was in the district of Hazaribagh, and I was going from Giridi to Hazaribagh in a *push-push*, a sort of four-wheeled, inferior, springless brougham, when I saw a flock of about forty Teal on a tank close by the road. I got out of the *push-push*, walked up to the tank and got two birds with a right and left as they rose, the birds wheeled round and I got a third, they then went to another tank about 600 yards away, and as I followed them up again rose and returned to the first piece of water leaving a fourth bird with me. I too went back and got yet another brace, and after these yet another bird on the second piece of water, and when I left with seven Teal the rest were already back on the tank by the road. This was of course in a badly watered part of the country, but on no other occasion, whether there was water in abundance or not, have I ever known Garganey remain to have more than a right and left fired at them.

They are very silent birds as a rule. Hume speaks of them chattering like all other ducks in confinement on the slightest provocation but their ordinary note, a loud strident quack, is very seldom used when the birds are in a state of nature.

As regards the breeding of the Garganey within Indian limits there is practically no evidence of any value.

Colonel Irby told Hume that when in Oudh he caught some young *half fledged*, in the month of September. This shows, of course, that once upon a time a pair of Teals did remain in India and breed, but it does not at all show that Teal ever stay *of their own accord* to breed. This unfortunate pair had very likely been slightly damaged by shot or accident and so were unable to take the exertion of migration, and this, doubtless, is the reason for the many Teal staying in India and being seen in various months when they should have been far away and breeding in other climates and countries. They have been seen in practically every month in the year and such records are many, but as I have said elsewhere, every year millions are killed, and it would be strange indeed if a few did not get injuries from which they recovered yet not sufficiently soon to allow of their migrating.

Colonel Tickell writing from Moulmein mentions a young bird just fledged, which had been caught on a small pond in the vicinity. This may have been a young bird, backward and rather weak and consequently so exhausted with its long journey as to be caught and produced as a specimen locally bred, or it may have been one bred under the circumstances already suggested.

Blyth wrote in reference to this statement of Tickell's : " The Garganey breeds sparingly no doubt in India, as well as in Burmah and Tennasserim," but from what this deduction was made I cannot tell nor can I find any perfectly authentic record of the Garganey breeding in India beyond the circumstantial evidence given by Colonel Irby's young birds.

They breed throughout the North Temperate Zone in Europe and Asia. In the former continent they breed as far South as France, north Italy, Greece and throughout the Balkan States and Russia into Asia. In parts of Asia Minor, South Siberia, Manchuria, Amoor and Northern China, but not in Japan as far as is yet known.

They desert the larger open pieces of water during the breeding season and resort to smaller pools and ponds, fens and bogs, rarely the mossy and weed-covered borders of streams and yet more rarely the reed-fringed shores of lakes, etc.

Although so commonly found on the sea coast and on salt water creeks and tidal waters yet the Garganey seems always to breed inland and I can find no record of their nest or eggs being taken in such places.

The nest is the usual mass of reeds, weeds and soft vegetation made by most ducks and it is said that occasionally they are made of sticks and twigs, but this I imagine is very exceptional.

The lining of down and feathers varies much, in some it is very dense and copious, in others very scanty; normally it is neither the one nor the other, rather scanty however than otherwise.

It is most often placed in some thick tuft of coarse grass, bed of reeds or tangle of shrubs and grass in fenland or on the borders of some vegetation-covered piece of water. The eggs vary in number from six to thirteen, the number most often found being from eight to ten.

Morris gives the number laid as eight to ten or even fourteen. According to him incubation lasts twenty-one days and the young birds follow their mother to the water as soon as hatched.

The eggs, at least all I have seen, were quite indistinguishable from those of the Common Teal, in shape, texture and size, and I think in colour. Hume says that they have perhaps a more yellow creamy tinge, but though a few may be more buff or yellow in tone than any of that bird, many are no deeper at all.

Dresser gives the average as 1·87″ by 1·35″; those in my collection average 1·82″ by 1·36″, making them out to be rather shorter and broader.

Genus SPATULA.

The genus *Spatula* is distinguished from all other genera except the Australian *Malacorhinchus* by the shape of the bill which is broadly spatulate, the sub tip being about twice as broad as it is at the base. There are four species whose range is practically cosmopolitan, but only one is represented in India, *viz.*, the Common Shoveller.

The lamellæ are very long, thin and prominent, and the edges of the upper mandible are much turned down on the terminal quarter.

The tail feathers number fourteen in both sexes.

(29) SPATULA CLYPEATA.

The Shoveller.

Spatula clypeata., Jerdon, "Birds of India," III, p. 796; Hume, "Str. Feath.," I., p. 260; Adam, *ibid*, p. 402; Butler, *ibid*, IV, p. 28; Scully, *ibid*, p. 199; Fairbank, *ibid*, p. 264; Ball, *ibid*, VII, p. 232; Hume, *ibid*, p. 492; *ibid.*, Cat., No. 957; *id*, "Str. Feath.," VIII, p. 115; Scully, *ibid*, p. 362; Legge, "Birds of Ceylon," p. 1086. Hume and Marshall, Game Birds, III, p. 141; Vidal, "Str. Feath.," IX, p. 92; Butler, *ibid*, p. 437; Reid, *ibid*, p. 80; Davidson, *ibid*, p. 325; Hume, *ibid*, p. 417; Macgregor, *ibid*, p. 472; Barnes, "Birds of Bombay," p. 401; Hume, "Str. Feath.," XI, p. 343; Salvadori, "Cat., Birds of British Museum," XXVII, p. 306; Blanford, "Avifauna of Birds of India," IV, p. 452.

Description: Adult Male.—Whole head and neck glossy green, shewing a purple tinge in certain lights, especially on the upper parts:

upper breast, lower neck, outer scapulars and outer portions of upper back mauve white ; a narrow centre patch from the neck brown, the feathers edged pale, in fine specimens with broad white edges ; back brown the feathers pale edged ; rump and upper tail coverts black, glossed with peacock green and blue, the former tint predominating ; rectrices brown, edged white, increasingly broader on the outer ones ; lower breast, flanks and abdomen rich rufous chestnut, some of the feathers on the posterior and interior flanks lighter and vermiculated with brown ; thighs the same but duller, sometimes a few black spots on the breast ; wing coverts a beautiful blue grey, some of those next the inner secondaries glossed Prussian blue on the terminal quarter of the outer web; greater coverts more brown and edged with white forming a wing bar next the speculum ; one of the outer scapulars brilliant grey blue, others black glossed with green and with white centres, tertiaries deep brown black, glossed with green turning to blue at the tips, quills dark brown ; speculum a brilliant metallic green ; under tail coverts black, glossed with blue green ; flanks next tail coverts white.

Bill black ; legs orange, claws horny brown, irides yellow, orange or orange red.

" In the male in winter the bill is black, usually with a greyish shade ; in some it may be called leaden dusky. In November when they first arrive, and in the case of birds of the year until much later, the bills of the males are like those of the females.

" The irides vary, as a rule, in the male from yellow to reddish orange, but I have recorded them as brown in two or three males.

" The legs and feet vary from orange to Indian or tile red and are usually brighter coloured in both sexes in the spring, and at the same season in the male than in the female. The webs are often dusky towards their margins." (Hume).

Length about 2″ ; wing 9·3″ to 9·8″ ; tail about 3·5″ ; bill from gape about 3″ ; tarsus 1·4″.

" Length 19·7″ to 21·75″; expanse 29·75″ to 32·5″ ; wing 9″ to 9·8″; tail from vent 3·6″ to 4″ ; tarsus 1·2″ to 1·5″; bill from gape 2·95″ to 3·05″; weight 1lb. 3 oz. to 1 lb. 14 oz." (Hume).

After the breeding season the male assumes the plumage of the female but may always be distinguished by the speculum on the wing, generally darker, less marked upper parts, and the plain dark upper tail coverts.

Blanford says " it is rare in India, so far as my experience goes, to see a male in full plumage before the end of February," but I should note that I have a male in splendid plumage shot in November.

Female.—The whole upper plumage brown, each feather edged with pale rufous or dirty rufous white ; wing coverts grey ; quills brown with faint traces of the speculum and the white terminal bar to the wing coverts well defined. Lower parts dull brownish buff varying a good deal in depth and tint, the brown bases to the feathers showing through in dark crescentic bands on breast, flanks and sides, but not at all, or only slightly on the abdomen ; chin immaculate ; neck and sides of head speckled with dark brown.

Most ducks, but not all, have a well defined white loreal spot speckled brown.

Irides brown or orange brown ; legs like those of the male, but duller at all seasons ; bill dull brown, the lower mandible dull orange or orange brown.

" In the female, the upper mandible is dark brown, tinged reddish along the commissure and on the nail, while the lower mandible is dull orange, brownish towards the tip.

" The irides vary . . . . . in the female from brown to reddish brown, but I have recorded them . . . . . as light yellow in one female, so that there is only a general, and not a constant, sexual difference in the colour." (Hume).

Length about 18·5″; wing 8·1″ to 9·2″; tail about 3·5″ or less ; tarsus 1·2″ to 1·4″ ; bill from gape 2·8″.

" Length 18·0″ to 19·0″ ; expanse 27·0″ to 29·5″ ; wing 8·0″ to 8·9″ ; tail from vent 3·5″ to 3·85″ ; tarsus 1·2″ to 1·4″; bill from gape 2·65″ to 2·87″ ; weight 1 lb. to 1 lb. 7 ozs." (Hume).

Male in first plumage resembles the female, but the wings are brighter coloured ; bill pale reddish brown ; legs and feet flesh colour.

Males in their post nuptial plumage have the white of the breast with a few dark crescentic bands, the lower belly with dark bars, and the rich black of the under tail coverts mottled with chestnut and white.

" *Young in down* resemble those of the Wigeon in having the upper parts almost uniform, with indistinct pale spots, but they possess the dark brown stripe through the eye as in the young Mallard. The bill is not widened at the tip but it grows very rapidly " (Salvadori.)

The Shoveller is to be met with at different times throughout the whole of the Northern hemisphere, in all four Continents. Found over practically the whole of Europe and Asia at the various seasons, it extends in winter as far south as Somali land in Africa and in America to the 18th degree latitude north, in the West Indies, and even further south in Guatamala.

The references made to its occurrence in Australia and South America apply to allied species and not to the Common Shoveller.

In India proper the Shoveller is a winter visitant to all parts from the extreme north to the extreme south, but though it surely must occur there at times it has not yet been recorded from Pegu and Tennasserim.

In Ceylon it is also fairly common, Legge writes : "This remarkable and almost cosmopolitan Duck is a not unfrequent winter visitor to Ceylon. I have not met with it myself, but Mr. G. Simpson informs me that it comes in large numbers to Delft and the Palverainkados and Mullaittiva lagoons, remaining during the same periods as the Teal and Pintail."

The Shoveller is not one of the earliest ducks to arrive, as a rule it comes into the more northern portions of India in the latter end of October or even early November and is later still in the southern parts of its range. In Bengal I think few are seen until November ; in Assam, especially in the extreme north-east, I have seen them in October. It leaves, as well as arrives, later than many other ducks and may often be met with in Cachar during April, and Hume says that some remain in the Peshawar Valley until May and that in Cashmir they remain until quite the end of that month.

In the extreme north of its range and in the Himalayas it is only seen whilst on migration during the months of late September and October and early November and again in March and April as the birds go north. In Kashmir, however, a good number pass the whole winter. Adams says that it is found throughout the whole year there, but this statement has never yet been confirmed.

Although common over the major part of the country it visits, it does not seem anywhere to be found in very large numbers and may often be seen in pairs or even singly. I do not remember ever seeing a flock which numbered over forty and should imagine such a flock to be rare anywhere.

As regards its haunts, these are everywhere and anywhere, but it does not care for open, deep water and it prefers small creeks, ponds, jheels and tanks which are well covered with vegetation, and also stretches of shallow water with plentiful cover and a muddy bottom.

Hume says : "To the shores they stick, into the open water they never seem to straggle by choice, and if you watch them they are for the most part either dozing on the brink or paddling slowly in the shallows, with their entire bills and more or less of their heads under water, their heads working from side to side all the while like a Flamingo's or Spoonbill's."

I have, however, seen the Shoveller in open water, but this only rarely and only during the heat of the day, when the birds wish to sleep.

As noted above by Hume they feed with bills and heads under water, running the former through the shallows in the mud and so collecting the numerous small forms of animal life which there abound and which, when the bill is lifted, are retained whilst the water filters out. They are omnivorous and will eat almost anything, but at the same time animal food undoubtedly forms the major portion of their diet.

Except for the very handsome appearance of the full plumaged drake, the Shoveller is worth little from any point of view. As an edible they are one of the worst of the duck tribe; coarse, oily and fishy in taste and ranking equal to the white-eye and inferior to the whistling teal.

As regards their feeding and its quality Hume writes : "Doubtless, in more savoury localities, such as the more aristocratic ducks frequent, insects and their larvæ, worms, small frogs, shells, tiny fish and all kinds of reeds and shoots of water grasses, rushes and the like, constitute their food ; but where they take up their abode on one of the village ponds, and the pond is a real dirty one, I can assert, from the examination of many recently killed birds, that it is impossible to say what these birds will not eat.

"All ducks are more or less omnivorous, but no other duck will, as a rule, frequent the dirty holes in which a pair of Shovellers often pass the entire winter."

A curious note on its food, etc., is that in Lathom's "Synopsis of Birds," in which he states : "Its chief food is insects for which it is continually muddling in the water with its bill. It is also said to dexterously catch flies which pass in its way over the water. Shrimps among other things, have been found in its stomach on dissection."

It is a bad swimmer and a worse diver and once shot takes little trouble to bring to hand, if only wounded. It flies however very well and strongly and in this respect it holds its own with teal and other swift ducks, though it is slow to rise, getting up heavily and awkwardly off the water and taking time to get up its speed.

They are very sociable birds and consort with Teal, Gadwall and other ducks. As a rule they are very tame and can be easily approached if the least caution is taken and they have the reputation of allowing repeated shots to be fired at them before a flock will leave the piece of water they are frequenting.

Blanford remarks that it never appears to feed like other ducks with its head and breast immersed and its tail sticking up vertically.

It is said to walk well, with a carriage similar to that of the Gadwall and Hume says it can even run if sufficient inducement be held out for it to do so.

Newton remarks on a peculiarity of this duck of "swimming round in circles with its bill in the water above the spot where Pochards are diving and feeding beneath and sifting out the substances that float up when disturbed by the operation of the diving ducks."

As regards their breeding in Indian limits all I can find is Layard's record noted by Legge : "Layard not only discovered it one year near Jaffna, but found it breeding there at the Chawagacherry lagoon in March. He then met with a female with twelve young ones, most of which he captured, and in the month of November he obtained specimens from native shooters."

This of course was an abnormal breeding incident in every way, time as well as locality, and it is very hard to give any reason for such a queer occurrence.

They breed throughout their Northern habitat, Asia, America, Europe and also in parts of Northern Africa. They are said to breed very extensively in Abyssinia and also in Algeria. In Asia it breeds in Turkistan, Northern Persia, and in the whole of its Northern Asiatic range.

In Europe it breeds over the greater part of the continent though absent in some countries and present in others quite as far South.

It makes a rather large, loose and untidy nest of soft reeds and rushes, &c., lined with down and places it on the ground in swampy land or by the edge of some piece of water in fen land. It does not appear to frequent open water *even* for the purposes of breeding and selects places well away from observation and interference and conceals its nest with great care. Hume says that the nest is a shallow depression in the soil made by the birds and thinly or thickly lined with down or dry grass.

The description of the down with which the nest is lined and which is of course taken from the bird itself is said by Legge to be "small, dark brown, with small plainly defined whitish centres."

The eggs vary in number from seven to sixteen, eight or nine being perhaps the number most often laid.

The colour is a pale, but rather clear tinted, yellow stone colour, some have a creamy tinge and others are slightly greenish, but a yellow-grey is undoubtedly the most common colour.

The texture is extremely fine and close with a surface slightly or decidedly glossed. My eggs average 2·06″ × 1·4″ and are in shape rather long ovals distinctly pointed at the smaller end.

Hume's series measured from 2·0″ to 2·2″ in length and from 1·33″ to 1·55″ in breadth.

Genus MARMARONETTA.

The genus *Marmaronetta* contains a single species only with a bill similar to that of *Nettion*, but differing from that genus in having no wing speculum. Its coloration, which gives a silvery grey tone to the plumage when taken as a whole effect, is quite sufficient to at once distinguish it from all other ducks, either Indian or otherwise.

MARMARONETTA ANGUSTIROSTRIS.

The Marbled Duck.

Querquedula angustirostris.—Hume, "Str. Feath.," I, p. 262; Anderson, *ibid*, III, p. 273; Butler, *ibid*, IV, p. 30; *id.*, *ibid*, V, p. 234; Hume and Marshall, "Game Birds of India," III, p. 237; Reid, "Str. Feath.", X, p. 82; McLeod, *ibid.* p. 168; Hume, *ibid*, p. 174.

Chaulelasmus angustirostris.—Hume, "Str. Feath.", VII, p. 493; *ibid*, Cat. No. 961 bis; Barnes, "Birds of Bombay," p. 405; Hume's "Nests, and Eggs," 2nd ed., III, p. 291; Barnes, Journal, Bombay Natural History Society, VI, p. 291.

Marmaronetta angustirostris.—Salvadori "Cat., British Museum," XXVII, p. 321; Blanford, "Avifauna, Birds of India," IV, p. 454.

Description. Adult Male.—Whole upper parts a silvery grey, each feather having the central portion darker and brownish and the tip and terminal edge paler; the head and nape is more buff in tint and has each feather centred brown, giving it a barred appearance; the parts surrounding the eye brown, forming a distinct dark brown eye patch; chin, throat and under part of the neck paler, almost white, with the dark centres much reduced and forming only a stippling; lower parts white, more or less tinged with buff and grey, and also barred with dark grey-brown on the breast, flanks and sides, and, less distinctly, on the lower tail-coverts. Tail a silvery brown-grey, edged paler; wings silver grey, the outer secondaries a purer, paler colour and the inside of the primary quills darker and brown; all the feathers, coverts and quills, have the shafts brown distinctly shewing against the grey.

"Length 18·3″ to 19″; expanse 28·5″ to 29·5″; tail from vent 3·6″ to 4·0″; wing 8·1″ to 8·5″; wings when closed reach to 0·7″ to 1·5″ of end of tail; bill at front, including nail 1·77″ to 1·85″; tarsus 1·44″ to 1·52″; weight 1lb. 3ozs. to 1lb. 5ozs."

"The legs and feet are dusky olive or dark horny brown, with the claws and webs black; or horny green with the webs and claws dark grey; the bill bluish grey, black on the culmen and tip; or dusky, bounded at the margins of the feathers of the forehead and cheeks with a pale leaden blue line, continued along the margins of both mandibles to near the tip, and a spot of the same colour just above the nail, the irides are brown." (Hume).

Female.—Only differs from the male in being smaller, having the eye patch less pronounced and the general plumage duller and more uniform in colour and the crest also is less developed.

"Length 16·9″ to 17·5″; expanse 27″ to 28″; tail from vent 2·8″ to 3·7″; wing 7·9″ to 8·1″; wings when closed reach to within 0·5″ to 1·0″ of the end of the tail; bill at front 1·6″ to 1·75″; tarsus 1·4″ to 1·5″; weight 1lb. to 1lb. 3ozs." (Hume).

"Length 15·75″; expanse 26·5″; wing 7·62″; tail from vent 2·75″."

"Legs and feet greenish plumbeous; irides dark brown; bill dusky plumbeous, darkest on the culmen." (Butler).

" *Young.*—Similar to the female but all the markings and tints still duller, the lower parts almost uniform dull pale greyish." (Salvadori).

A young female obtained by Major Olivier and now in this Society's collection has the wing only 7·42″ but at the same time has the bill about 1·8″.

The range of the Marbled Teal extends from the countries to the West of the Mediterranean Sea, through those bordering it North and South into Western Asia, India being its Eastern limit. It is also found in the Canaries.

As regards India little has been recorded about its habitat since Hume wrote in " Game Birds " :—

" Its normal range with us (it is presumably only a cold weather visitant) appears to be the whole of Sindh (from every Collectorate in which it has been recorded, and where it is extremely common) and Northern Guzerat, the Southern part of the Dehra Gazi Khan district, and of Bhawalpur, in all three of which it is a regular but less abundant visitant. No doubt it will be met with in Kutch and Kathiawar, but it has not been thence recorded as yet.

" But outside these limits, it occurs much further east as a straggler. I have had specimens from Western Oodeypore, and from near Delhi. The late Mr. A. Anderson procured it in the North-West Provinces at Futtehgarh, and in Oudh near Hurdui; and I myself procured two freshly killed specimens in the Calcutta Market, the one in December and the other in February, which had been captured about 22 miles south-west, and some 18 miles west, respectively of the metropolis."

Since this was written the Marbled Teal has been obtained in Kutch, several times again about Delhi and more than once also in the Calcutta Market, but nothing has been recorded that I can find which in any way extends the original area as given by Hume. A specimen, lent me from this Society's collection, has no locality given on its ticket, but was presumably collected in one of the places above mentioned.

I should note that once when showing this specimen to a friend he at once said that he had shot two birds of the same kind in Gowhatty, Assam; he said that neither he nor any of the men to whom he showed them had ever seen the duck before and could not name it. He was very sure of its being the same species.

In its arrival it appears to be later than most ducks, even in its extreme North West point of entry it does not appear to be seen in any numbers until late in October or early November and as it works South and East it of course gets later and later. Its departure would, on the other hand, seem to take place at much the same time as that of other birds of its order, *i.e.*, in April, a few remaining until the last few days of May in very late years.

Little has been added to our knowledge of the habits of this Teal since Hume wrote concerning it as follows :—

"In Sindh where I had abundant opportunities of observing it, I found the Marbled Teal invariably associated in large parties. Its favourite haunts were broads, thickly grown with rush, in which it fed and sported, comparatively seldom showing itself in the open water. As a rule it does not at once rise when guns are fired as the other ducks do, but if by chance, it is at the moment outside of the rushes or similar cover in the open water, it scuttles into concealment, as a coot would do, and if in cover already, remains there perfectly quiet, until the boats push within 60 or 70 yards of it; then it rises, generally one at a time, and even though fired at, not unfrequently again drops into the rushes within a couple of hundred yards. When there has been a good deal of shooting on a lake and almost all the other ducks, and with them of course *some* of these are circling round and round, high in the air, you still keep, as you push through the reeds and rushes, continually flushing the Marbled Teal, and the broad must be small, or the hunting very close and long continued to induce all the Marbled Teal to take wing. Of course where there is a little cover (though there you never meet with this duck in large numbers) they rise and fly about with the other ducks, but their tendency in these respects is rather coot-like than duck-like. Individuals may take wing at the first near shot, but the great majority of them stick to cover as long as this is possible; and on two occasion I saw very pretty shooting, boats in line pushing up a wide extent of rush-grown water, and the Marbled Teal rising every minute in front of us at distances of sixty or seventy yards, like Partridges out of some of our great Norfolk turnip fields; here and there a Shoveller or a White-eyed Pochard, both of which when disturbed, cling a good deal to cover, would be flushed, but there was not one of these to ten of the Marbled Teal. . . . .

The flight of this species, though Teal-like, is less rapid and flexible (if I may coin an expression to represent the extreme facility with which that species turns and twists in the air) than that of the Common Teal. It more nearly resembles that of the Garganey, but is less powerful and less rapid even than that of this latter species. There is something of the Gadwall in it, but it wants the ease of this. It flies much lower too, and as already mentioned much more readily resettles after being disturbed. I have hardly ever seen them swimming in the open, and in the rushes they make of course slow progress. When wounded they dive, but for no great distance, and then persistently hold on under water in any clump of rush or weed, with only their bills above water. I have never seen them on land in a wild state, but some captured birds, whose wings had been clipped, walked very lightly and easily; and though they had been but a few days in confinement, they were very tame and could, I should imagine, be easily domesticated.

" In Spain they are described as very wary, and there they seem to frequent open water; here they avoid this latter as a rule, and are, I should say, amongst the tamer of our ducks.

" Their food is very varied here. Favier says that in Tangiers they feed on winged insects; in Sindh the major portion of their food consist of leaves, shoots, rootlets, corns and seeds of aquatic plants, intermingled with worms, fresh-water shells, insects of all kinds, and their larvæ. I believe I found a small frog in the stomach of one, but it is not noted on the tickets of any of the specimens now in the Museum, and I cannot be quite sure."

Its voice has been variously described as a whistling croak, a low croaking whistle, a rather hoarse quack, and a quack like that of the domestic duck but very harsh and abrupt. It is probable that these descriptions apply to two notes, and that this duck, like some others, has two distinct calls, one more or less of a whistle, the other somewhat of the nature of a quack.

Its food is practically omnivorous, and as an article of diet itself it is not first class.

Mr. B. Alexander found it breeding plentifully in the Cape Verd Islands, and it appears to breed on the greater portions of its habitat round the Mediterranean. Although breeding in latitudes so far south, it is an unusually late breeder, May and June being the months in which the eggs are laid. It is said to make a rough nest much like that of the Common Teal, and to place it amongst rushes on land surrounding swamps and various kinds of water and also on the sea-shore, this last more especially in Spain. Of this latter country Colonel Irby thus records their nesting in Andalusia :—" The Marbled Duck breeds during the last week in May, nesting in patches of rushes. The nest is like that of a Teal, containing a good deal of the down from the breast of the female, and eleven eggs appear to be the usual complement. The latter much resemble those of the Common Teal, being of a yellowish white colour. Favier states that (near Tangiers) they also nest in rushes during May and June, and that incubation lasts from twenty-five to twenty-seven days."

The eggs which Colonel Butler received from the Mekran coast are in all probability rightly identified by him as being those of the Marbled Teal. He says : " I received some small ducks' eggs from the Mekran coast, which are in my opinion those of the Marbled Duck. The nest was on the ground under a solitary babool bush, growing on an extensive tract of salt marsh, some seven or eight miles north of Ormarra, called Moorputty, and consisted, according to the account of the native who found it, of a collection of fine twigs formed into a solid pad with a few pieces of down as a lining and measuring eight or nine inches in diameter.

" The eggs eight in number, and of a delicate cream colour were taken on the 19th June, 1878. I have carefully compared them with eggs of the Marbled Teal and find that they agree exactly, both in size, colour and texture. They are certainly not Garganey's eggs, being too large ; I know of no other duck inhabiting that district they could possibly belong to except the present species.

" They vary in size from 1·8″ to 1·9″ in length, and from 1·35″ to 1·43″ in breadth."

Barnes in his article on " Nesting in Western India " noted that he too had received some eggs from the Frere Museum which had come from the Mekran Coast about the same time as those received by Colonel Butler. He describes them as being of a creamy white, much soiled and dulled by lapse of time, but he does not give their dimensions.

(*To be continued*).

MONOGRAPH OF THE PILL-MILLIPEDES (ZEPHRONIIDÆ) INHABITING INDIA, CEYLON AND BURMA.

By R. I. Pocock, of the British Museum of Natural History.

Part II (*with Plate B.*)

Read before the Bombay Natural History Society on 14*th June*, 1898.

(*Continued from page* 285 *in this Volume.*)

Genus Zephronia, Gray.

Griffith's Animal Kingdom, XIV, pl. cxxxv, fig. 5 ; also XV, p. 796 (1832).

Zephronia tumida (Butler), pl. B., fig. 8-8 b.

Zephronia tumida, Butler, Ann. Nat. Hist. (5) IX, p. 196, fig. 1 (1882).

Colour.—Head and nuchal-plate black ; anterior half of tergites testaceous ; posterior half black ; striped very much as in *Z. tigrina.*

Tergites.—Anterior half, except of first, thickly granular ; posterior half thickly and finely punctured.

Head thickly punctured below, less thickly above.

Nuchal-plate sparsely punctured above, thickly below, where it is marked by a nearly straight fine ridge.

2*nd tergite* with anterior border vertical; lamina scarcely developed, represented almost wholly by the slightly thickened edge of the tergite.

Anal tergite (♂) very slightly hollowed towards its free margin, without marginal notch, and with inner ridge represented merely by two black tubercles. *Antennæ* with apical segment considerably dilated. *Legs* as in *Z. nigrinota. Forceps* almost exactly like those of *Z. nigrinota* ; in the first pair the immovable dactylus is more curved and bears a tooth at the base, and the distal segment of the movable dactylus is much smaller; in the second pair the distal segment of the movable dactylus is slightly dentate at the apex.

Length 42 mm.

A single male specimen from Coremia, North Assam (*E. W. P. Cambridge*). In sculpturing this species resembles those allied to *Z. ovalis* (Gray), but the form of the forceps seems to indicate greater affinity with *Z. nigrinota.*

Zephronia tigrina (Butler), pl. B., fig. 10.

Syn. *Zephronia tigrina*, Butler, Ann. Nat. Hist. (4), X, p. 356, pl. xviii, fig. 7 (1872).

Colour.—Mostly striped black and yellow, the anterior portion of the tergites being ochraceous, the posterior border black ; head and nuchal-plate black.

Tergites.—Anterior and posterior portions smooth, middle portion rugulose, very closely and somewhat deeply punctured ; anal tergite thickly punctured.

Head deeply punctured, thickly below, sparsely above.

Nuchal-plate deeply and sparsely punctured, crossed by a fine nearly straight groove and with sinuate inferior border.

Second tergite with abruptly sloped anterior border and upturned edge ; lamina scarcely developed, represented almost wholly by the slightly thickened border of the tergite, evenly arched.

Anal tergite without marginal notch, and with inner ridge represented by a fine piece.

Claws as in *Z. nigrinota.*

♂ Apical antennal segment short, stout, piriform. *Anal tergite* with border produced downwards and backwards ; lightly saddle-shaped. *Forceps* so closely resembling those of *Z. excavata* as to need no description.

♀ Apical antennal segment much less dilated than in male ; sub-cylindrical. *Anal tergite* with edge feebly produced behind, and very feebly saddle-shaped. *Vulva* as in *Z. excavata.*

Length up to nearly 40 mm.

Type specimen and others labelled E. Indies ; also several from Darjeeling presented to the British Museum by M. Adrien Dollfus.

This species bears almost the same relationship to *Z. excavata* that *Z. tumida* does to *Z. nigrinota.* It differs in being striped black and yellow, and in being punctured whereas *Z. excavata* is nearly of a uniform tint and smooth.

Zephronia excavata (Butler), pl. B., fig. 12-12 b.

Syn. *Zephronia excavata,* Butler, Ann. Nat. Hist. (4), XIV., p. 185, pl. xvi, fig. 1 ♂ (1874).

Colour olivaceous ; hind margins of tergites reddish.

Tergites smooth, polished, without punctures or granules.

Head very sparsely punctured. Nuchal-plate without punctures with a fine and nearly straight groove before its sinuate anterior border.

1st tergite somewhat abruptly sloped in front, but not sulcate; lamina small, rising gradually, with evenly thickened edge.

Anal tergite without marginal notch, but with a distinct inner ridge.

Legs attenuate at the apex, with a single spine above claw.

♂ Apical segment of antennæ distally expanded. *Anal tergite* markedly saddle-shaped. *Forceps.*—1st pair with immovable dactylus a little shorter than the movable, lightly incurved; movable dactylus stout, externally convex, internally concave, with rounded apex, not dentate, the distal end indistinctly separated by a suture. Second pair with immovable dactylus blade-like, wider at base than apex, with nearly straight outer and inner edges and truncate apex, not dentate; movable dactylus with its distal third separated as a distinct segment, wider at base than apex, with very convex outer surface and correspondingly concave inner surface.

♀ Apical antennal segment almost cylindrical, very slightly dilated at its distal end. Anal tergite not saddle-shaped, evenly rounded. *Vulva* with proximal portion much the larger of the two and somewhat quadrate, with straight inner border and convex outer border; the distal portion or cap very short, as in *Z. impressa*, with rounded outer and inner angles and lightly concave distal margin.

Length less than 20 mm.

Several specimens of both sexes from Sikkim (*Dr. Hooker*).

This species is most nearly related to *Z. tigrina.* It differs from it, however, in being wholly smooth and differently coloured. The difference exhibited by the sexes in the form of the apical antennal segment led Mr. Butler to refer them to two distinct genera.

Zephronia maculata (Butler), pl. B., fig. 13.

Sphærotherium maculatum, Butler, Ann. Mag. Nat. Hist. (4), XIV, p. 186 (1874).

This species, of which only the female is known, is closely allied to the preceding, *Z. excavata*, Butler. It is kept, however, separate from the latter on account of the characters mentioned in the key to the species published on p. 471.

Length about 35 mm.

Locality.—Sikkim (*Dr. Hooker*).

Zephronia nigrinota (Butler.), pl. B., fig. 11-11 b.

Syn. *Zephronia nigrinota*, Butler, Ann. Nat. Hist. (4), X, p. 356, pl. xviii, fig. 9 (1872).

Syn. *Zephronia lævissima*, id., Ann. Nat. Hist. (4) XIV, p. 185, pl. xvi., fig. 4 ♂ (1874).

Syn. *Sphæroth. politum*, id., *tom. eit.*, p. 186, pl. xvi, fig. 2 ♀ (1874).

Colour varying from ochraceous to piceous.

Tergites with hinder half smooth and polished ; anterior half exceedingly finely granular ; anal tergite very smooth and shining.

Head sparsely punctured above, more thickly below. *Nuchal plate* mostly wholly smooth, with sinuate lower margin marked by a nearly straight fine groove.

Second tergite with somewhat vertical but not sulcate anterior portion ; lamina small, rising gradually, with evenly arched front border and evenly thickened anterior edge.

Anal tergite evenly rounded in both sexes, without marginal notch, and with inner ridge represented by two pieces.

Legs attenuate at distal end with a single spine above and behind the claw ; claw less arched.

♂ Anal tergite evenly rounded. Apex of antennæ larger than in female. *Forceps.*—1st pair with immovable dactylus crescentic, exceedingly incurved; movable dactylus composed of two segments, whereof the proximal is furnished distally with a series of denticles, and is much longer and stouter than the distal, and separated from it by a constriction. 2nd pair with immovable dactylus slender, nearly parallel-sided, rounded apex, and bearing on its inner surface a bifid membranous tooth ; movable dactylus, with its distal third distinctly segmented, furnished behind, as also is the immovable dactylus, with a row of denticles.

♀ Anal tergite like that of the male. Apical segment of antennæ conical, but less dilated distally than in the male. *Vulva* with proximal portion with convex infero-external border, straight internal border ; distal portion or cap internally produced into a conspicuous more or less blunted process ; external angle very convex ; concave between the external and internal angles.

Length between 30 to 40 mm.

Locality.—Type specimens of *lævissima* and *politum* from Sikkim, of *nigrinota* from Assam, others from Darjeeling (*Miss Dendy*).

This species is related to *Z. excavata*, but differs in the particulars pointed out under that species.

The type of *Z. lævissima* does not apparently differ in any specific character from the type of *Z. nigrinota.* The type of *Sphærotherium politum*, although referred to as another genus by Mr. Butler, is merely a female specimen of *nigrinota.*

Zephronia doriæ (Pocock).

Ann. Mus. Genova (2), IX, p. 79, fig. 1 (1890) ; also op. cit. (2), X, p. 394 (1890).

In this species the colour of the segments is chestnut-brown, with the posterior border black, but the black stripe is not sharply defined in front.

In front the segments are thickly granular, and behind the granular area are a small number of scattered punctures. Head, nuchal-plate, and 2nd tergite distinctly punctured ; anal tergite much more closely punctured throughout, without marginal groove, but longish undivided inner crest.

Length 37 mm. (nearly 1½ inch).

Locality.—Kachin Hills, east of Bhamo, Upper Burma (*L. Fea*).

Zephronia feæ (Pocock).

Ann. Mus. Genova (2), IX, p. 80, fig. 2 (1890) ; also op. cit. (2), X, p. 394 (1890).

This species is easily recognisable from *Z. doriæ* by being of a dark yellow or rather green colour, indistinctly clouded with paler yellow, and by having all the segments densely and closely punctured throughout above. It is also of much smaller size, measuring a little less than one inch in length.

Locality.—Teinzo on the Moolay River, north-east of Bhamo, and Kachin Cauri to the east of Bhamo, Upper Burma (*L. Fea*).

Zephronia clivicola (Pocock).

Ann. Mus. Genova (2), X, p. 386, fig. 1 (1890).

This species is very closely related to *Z. fea* in colour and in the majority of its structural character. The first pair of forceps of the copulatory organ however are rather differently formed, and the colouring is less mottled, the anal tergite being a uniform yellowish brown. It is also a little larger, measuring about 1⅓ inch in length.

Locality.—Villages of Puepoli and Meteleo, about 3,000 feet altitude, in Upper Burma (*L. Fea*).

Zephronia formosa (Pocock), pl. B., fig. 9.

Ann. Mus. Genova (2), X, p. 387, fig. 2 (1890).

This handsome species may be readily distinguished from the rest of the Burmese species by its beautiful colouring, being a rich black with a bright yellowish-red stripe on each segment in front of the posterior border. The anal tergite moreover is strongly saddle-shaped, very much as in *tigrina* (Butler), that is to say, is concave from above downwards, and convex from side to side, with the inferior border produced. The tergites are granular in front and striate throughout.

Locality.—Village of Thao, about 3,000 feet, and villages of Puepoli and Meteleo, about 3,000 feet, in Upper Burma (*L. Fea*).

Zephronia semilœvis (Pocock), pl. B., fig. 14.

Ann. Mus. Genova (2), X, p. 138, fig. 3 (1890).

The segments in this species are ochre-yellow, smooth and densely pubescent in front, black and polished behind, the anal segment being ochre-yellow and polished and having no inner crest. There are two spines above the claw on the legs.

Length nearly an inch and a half.

Locality.—Tenasserim. Specimens were taken by Mr. E. W. Oates in the southern portion of this country and by Signor L. Fea at Malewoon,

Easily distinguishable from all the forms in the characters mentioned in the diagnosis.

Zephronia gestri (Pocock).

Ann. Mus. Genova (2), X, p. 390, fig. 4 (1890).

A small green species, with the hinder border of its tergites reddish. Tergites smooth in front, minutely punctured throughout. The form in size and general appearance resembles *Z. excavata* (Butler) but may be recognised from it by having the 2nd tergite crossed by a distinct groove behind its anterior border, and by having the anal tergite of the male convex from above downwards and not strongly saddle-shaped.

Length a little over half an inch.

Locality.—Thagata on Mount Mooleyit, about 1,400 feet (*L. Fea*).

Zephronia comotti (Pocock).

Ann. Mus. Genova (2), X, p. 391, fig. 5 (1890).

This species is smaller than *gestri*, which it much resembles in colour and sculpture. The laminate portion of the 2nd tergite is however considerably larger, and the copulatory forceps are differently shaped.

Length about one-third of an inch.

Locality.—Minhla, in Burma (*G. B. Comotto*).

Zephronia crepitans (Pocock).

Ann. Mus. Genova (2) X, p. 392, fig. 6 (1890).

In size, colour, and ornamentation the species very closely approaches *Z. comotti* and *Z. gestri*, of which only the males are at present known. It may however be at once recognized from these two by the fact that the anal legs of the male are very long with strongly curved femur; and the second pair of forceps of the copulatory apparatus are peculiarly modified, having short stout digits, with a stridulating plate attached to the basal segment of the movable.

Length half an inch.

Locality.—Rangoon (*E. W. Oates*).

Key to the Indian and Burmese Species of Zephronia.

a. Tergal plates granular in front.
  - a^1. Anal tergite strongly saddle-shaped in both sexes; striped red and black .... *formosa* Poc.
  - b^1. Anal tergite evenly convex in both sexes.
    - a^2. Anal tergite and posterior portion of the others exceedingly smooth and polished; crest on anal tergite divided .... *nigrinota* (Butl.)
    - b^2. Anal tergite at least finely punctured; crest on anal tergite undivided.
      - a^3. Crest on anal tergite small and tubercular, the posterior portion of it practically obsolete; conspicuously striped...*tumida* (Butl.)
      - b^3. Crest on anal tergite very long and entire; less conspicuously striped.
        - a^4. Posterior half of tergites almost wholly smooth, at most finely punctured .... *dorlæ* Poc.

b^4. Tergites conspicuously punctured to the very margin.

a^5. Colour redder with black posterior margin to the tergites; anal tergite pale, concolorous .... *clivicola* Poc.

b^5. Colour greener, clouded all over black and dark green..*feæ* Poc.

b Tergal plates not granular in front.

a^6. With more than one spine above the claw on the legs; terga anteriorly pubescent; ridge on anal tergite absent..............*semilævis* Poc.

b^6. With one spine above the claw on the legs; tergal plates not pubescent in front; crest on anal tergite present.

a^7. Crest on anal tergite smaller; tergites sculptured with a coarse network of punctures, margins smooth; of large size, conspicuously striped......*tigrina* (Butl.)

b^7. Crest on anal tergite larger; tergites smooth, minutely punctured throughout.

a^8. Second tergite crossed in front by a fine groove behind the border; of small size, green, terga banded posteriorly with red; anal tergite convex in both sexes.

a^9. Male, with long posterior legs and stridulating organ on the posterior forceps of the copulatory organ ...*crepitans* Poc.

b^9. Male, with posterior legs normal; no stridulating organ.

a^{10}. Lamina of 2nd tergite larger; digits of first pair of forceps of copulatory organ sub-equal and strongly curved...... *comotti* Poc.

b^{10}. Lamina of 2nd tergite smaller; digits of first pair of forceps straight and very unequal ......*gestri* Poc.

b^{8}. Second tergite not crossed in front by a supernumerary groove.

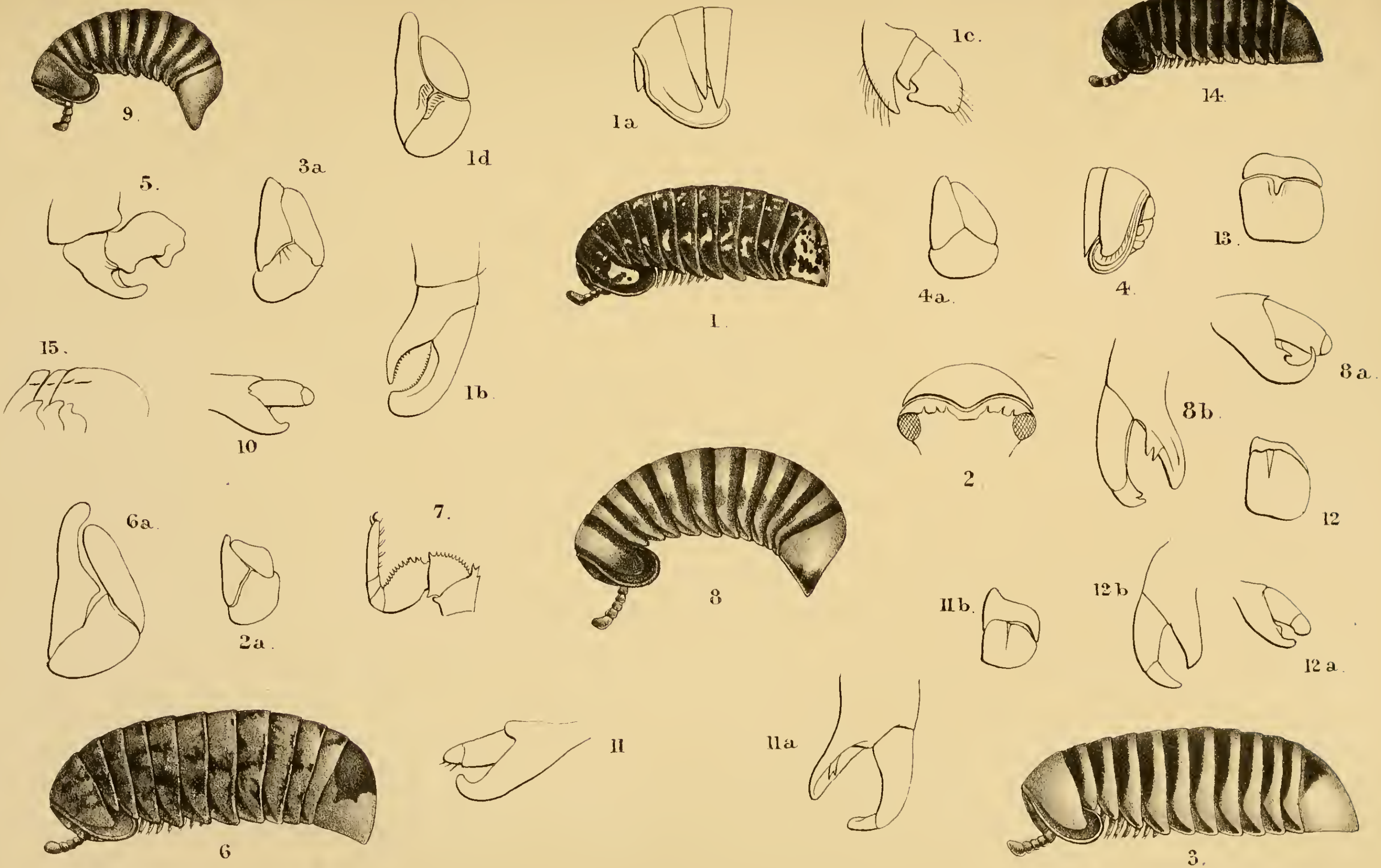
a^{11}. Of small size (19 mm.); vulva longer than wide; anal ridge longer ....*excavata* (Butl.)

b^{11}. Of larger size (30 mm.); vulva broader than long, anal crest shorter...*maculata*(Butl.)

EXPLANATION OF PLATE **B**.

Fig. 1 *Arthrosphæra versicolor*: natural size.
" 1*a* " " lateral view of 2nd tergite.
" 1*b* " " posterior forceps of copulatory organ.
" 1*c* " " anterior forceps of copulatory organ.
" 1*d* " " vulva.
" 2 " *noticeps*: anterior view of head.
" 2*a* " " vulva.
" 3 " *zebraica*: natural size.
" 3*a* " " vulva.
" 4 " *lutescens*: lateral view of head and 2nd tergite.
" 4*a* " " vulva.
" 5 " *atrisparsa*: anterior forceps of copulatory organ.
" 6 " *marmorata*: side view.
" 6*a* " " vulva.
" 7 " *pilifera*: leg to show spine armature.
" 8 *Zephronia tumida*: natural size.
" 8*a* " " anterior forceps of copulatory organ.

Fig. 8*b* *Zephronia tumida* : posterior forceps of copulatory organ.
,, 9 ,, *formosa* : natural size.
,, 10 ,, *tigrina* : 1st forceps of copulatory organ.
,, 11 ,, *nigrinota* : 1st forceps of copulatory organ.
,, 11*a* ,, ,, 2nd forceps of copulatory organ.
,, 11*b* ,, ,, vulva.
,, 12 ,, *excavata* : 1st forceps of copulatory organ.
,, 12*a* ,, ,, second forceps of copulatory organ.
,, 12*b* ,, ,, vulva.
,, 13 ,, *maculata* : vulva.
,, 14 ,, *semilævis* : natural size.
,, 15 *Arthrosphæra aurocincta* ; inner view of posterior tergites to show double crest on the anal plate.


9.
1d
1a
1c.
14.
5.
3a
1.
4a.
4.
13.
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10
1b.
2
8a.
8b.
12
6a.
2a.
7.
8
11b.
12b
12a.
11
11a
6
3.

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SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART VI.

By Sir G. F. Hampson, Bart., F.Z.S., F.R.S.

(*Continued from page* 314 *of this Volume.*)

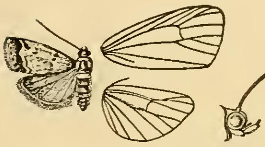
Genus Euzopherodes.

Euzopherodes.—Rag., Rom. Mem., viii. ined.

Type.—E. albicans.—*Rag.*

Range.—Bengal; Ceylon.

Palpi upturned, the second joint cylindrical, the third short; maxillary palpi filiform; frons rounded; antennæ of male almost simple. Forewing with the costa nearly straight, the apex rectangular; veins 3 and 5 stalked; 4 absent; 8, 9 stalked, 10 from cell. Hind wing with the cell long; vein 2 from well before angle; 3 and 5 on a long stalk; 4 absent; 6, 7 from upper angle; 7 anastomosing with 8.



Euzopherodes albicans ♂ ½.

4341*a*. Euzopherodes albicans, Rag., Rom. Mem., viii. ined., pl. xxxi, f. 23.

♂. Head, thorax and abdomen greyish white with a brown tinge. Forewing greyish white, irrorated with brown; the base brown; the first line brown, broad, prominent and erect, bent outwards at median nervure; the second line oblique from costa to vein 6, then excurved to vein 2 with a second line beyond and parallel to it; a prominent discoidal point at lower angle of cell; a marginal series of points. Hindwing suffused with pale brown; the cilia white.

Habitat.—Calcutta; Ceylon. *Exp.* 16mm.

4343*a*. Euzophera hemicautella, Hmpsn., Rom. Mem., viii. ined., pl. 47, f. 25.

♂. Maxillary palpi filiform; antennæ with slight sinus at base of shaft; mid and hind tibiæ fringed with long hair on both sides; forewing with a costal fold below, extending to two-thirds of wing; hindwing with veins 3 and 5 stalked.

Head and thorax fuscous brown; abdomen paler. Forewing dark brown, the cell suffused with ferruginous-red with a purplish tinge; a postmedial pale brown curved line strongly defined by a blackish line on inner side and slightly by fuscous on outer side. Hindwing semi-hyaline slightly tinged with fuscous; the veins, a marginal line, and line through cilia fuscous.

Habitat.—Puttalam, Ceylon (Pole). *Exp.* 16mm. *Type*—In British Museum.

4351. NEPHOPTERYX BASISIGNELLA, belongs to Sect. III, D. A.

♂. Forewing with suffused black scales along median nervure below; hindwing with streaks of black scales along median nervure and nervules, and a few on subcostal veins.

Sect. I., 4382*a*. MYELOIS STRIGIVENELLA, Hmpsn., Rom. Mem., viii. ined., pl. 55, f. 13.

♂. Head and thorax brown slightly tinged with grey; abdomen ochreous suffused with grey-brown. Forewing grey; the veins strongly streaked with dark brown; the whole inner area suffused with dark brown; cilia grey-brown with a pale line at base. Hindwing semi-hyaline silky white; the veins slightly darker; the costa brown; a fine brown marginal line and line through the cilia.

Habitat.—Khasis. *Exp.* 26mm.

4387*a*. PHYCITA SYMPHONIELLA, Hmpsn., Rom. Mem., viii. ined., pl. 56, f. 16.

Head, horax and abdomen grey-brown slightly irrorated with fuscous. Forewing variegated with grey, red-brown, dark-brown and black shades; an oblique dark-edged white line from cell to inner margin, with a tuft of raised dark scales on its inner edge and a triangular rufous patch beyond it on the inner side of the sinuous dark edged white medial line, which has diffused black beyond its costal portion; two prominent black discocellular specks; a submarginal whitish line angled outwards on vein 6 and defined by a black line on its inner edge, some rufous suffusion beyond it; the margin grey with a series of black specks. Hindwing pale fuscous, rather darker towards margin; cilia paler with a fine dark line through them.

Habitat.—Khasis. *Exp.* 24mm.

4389*a*. Antennæ of male with the shaft slightly curved near base with scale-teeth in the sinus.

PHYCITA POLYPTYCHELLA, Rag., Rom. Mem., vii. p. 244, pl. 16, f. 34.

♂. Head, thorax and abdomen greyish-brown mixed with dark brown and ochreous scales. Forewing grey, thickly irrorated with dark brown; a pale antemedial angulate mark from submedian fold to inner margin; two discocellular black specks; a submarginal pale line defined on each side towards costa by fuscous, oblique from costa to vein 6, then bent outwards and minutely dentate; a marginal series of dark points. Hindwing semi-hyaline brownish with fine marginal brown line.

Habitat.—Persia; Goorais Valley, Kashmir. *Exp.* 30mm.

Sect. III. A. 4391. PHYCITA CHLOROPTERELLA.

Palpi of male with the second joint hollowed out to receive the brush-like maxillary palpi; frons with tuft of hair; antennæ thickened and flattened with sinus and ridge of scales at base.

P. 93. 4392*a*.—PHYCITA SEMIUSTA, Hmpsn., Rom. Mem., viii. ined., pl. 56, f. 7.

♀. Head and thorax ochreous brown; abdomen ochreous with black dorsal tufts on first two segments. Forewing with the basal half ochreous; an almost medial line of raised scales with a few dark scales on its inner edge, and a prominent black patch on inner margin; the outer half of wing dark rufous with a broad postmedial band of dark grey-brown: the margin grey with a series of black specks. Hindwing pale fuscous; the fringe on median nervure ochreous; the cilia whitish.

Habitat.—Gambia; Sikhim; 1,800′ (Dudgeon). *Exp.* 22mm. *Type*—In British Museum.

4393. PHYCITA STENIELLA belongs to Sect. I. *c*, except that the antennæ have the shaft laminate instead of ciliated.

4394. *Phycita albilacalis* = PHYCITA (*Hyalospila*) LEUCONEURELLA, Rag., Rom. Mem. vii, p. 170.

Antennæ of male with slight ridge of scales at base of shaft and long uniseriate pectinations.

4400. *Phycita hemixanthella* = 4401. PHYCITA TRANSLUCIDELLA.

4410*a*. RHODOPHÆA ENDOLEUCELLA. Hmpsn, Rom. Mem. viii. ined. pl. 56, f. 1.

♂. Antennæ with a large sinus at base of shaft with a scale-tooth before it on upperside, and a series of spines in the sinus; collar with a large tuft of hair at middle, mid and hind tibiæ fringed with long hair; forewing with the inner area on underside clothed with yellow scales, and with an elongate oval patch of leaden grey scales at middle.

Head, thorax and abdomen olive brown ; vertex of head whitish ; metathorax purplish grey. Forewings moss green, olive yellow towards base ; a medial dark line oblique from costa to below cell and angled inwards on vein 1, with a large rounded yellowish white patch on its inner side from middle of cell to inner margin, and an elongate patch beyond it, extending along inner margin to the postmedial line, which is nearly straight from costa to vein 6, then dentate, the teeth ending in white points, then angled outwards and with two white marks on it on vein 1 ; a large obscure black discocellular ocellus ; the outer area purplish fuscous, except towards costa ; a large white patch on the margin below apex. Hindwing purplish fuscous, suffused with olive yellow towards costa ; cilia tipped with white.

Habitat.—Khásis. *Exp.* 30mm.

4410*b*. RHODOPHÆA FLAVICOLLARELLA, Hmpsn., Rom. Mem. viii. ined., pl. 56, f. 3.

♂. Palpi orange ; vertex of head white ; antennæ blackish ; collar orange, black at throat ; thorax green and black, with white scales on metathorax ; abdomen blackish, dorsally banded with orange towards base. Forewing with the basal area orange with some green at base of costa, and green irrorated with white on costa, before the antemedial broad, very irregular, shining white band edged by black lines, enclosing a black spot on costa, dentate inwards below costa and on median nervure, contracting in cell and at inner margin, and with a white spot beyond it above vein 1 ; the discal area moss green, with some orange marks on and below costa and, an obscure black discoidal ocellus with duffused black below and beyond it ; the outer half of inner area purplish with an orange patch beyond lower angle of cell, and a postmedial patch on vein 1 ; the postmedial line white arising from a spot on costa, then dentate, and angled inwards below vein 2 ; a large white patch on outer margin below apex ; a marginal series of black points. Hindwing pale brownish with fine brown marginal line and line through the cilia.

Structural characters as in *endoleucella*, except that the antennal scale-tooth is larger, and the yellow scales and oval patch on forewing obsolete.

Habitat.—Khásis. *Exp.* 24mm.

4415*a*. RHODOPHÆA NIGRALBELLA, Hmpsn., Rom. Mem. viii. ined. pl. 55, f. 14.

♂. Head and thorax black brown; abdomen paler brown. Forewings deep black brown; a triangular white patch on basal area extending along costa almost to middle; a medial white line from below cell to inner margin; a large postmedial triangular white patch on costa with its apex at lower angle of cell, and with the discocellular black points on it; a postmedial oblique white line slightly bent outwards at middle; some white on the margin below apex and a marginal series of black points. Hindwing dark fuscous.

Habitat.—Khásis. *Exp.* 16mm.

4419*a*. SPATULIPALPIA LOPHOPTERELLA, Hmpsn., Rom. Mem. viii. ined. pl. 52, f. 27.

♂. Head and thorax black brown; abdomen fuscous with pale anal tuft. Forewing deep red brown irrorated with a few white scales; the costal area deep black; the tuft in cell black and grey; black streaks between the veins of outer area; a fine postmedial line of white scales strongly angled inwards on vein 1; cilia grey at tips. Hindwing semi-hyaline white, the veins, a marginal line and the base of cilia fuscous.

Habitat.—Khásis. *Exp.* 18 mm.

This species belongs to Sect. III., but has the fold and fan of scales on forewing as in *flabellifera*.

Genus OMPHALOTA, nov.

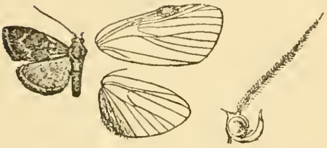
Type.—*O. chlorobasis*, Hmpsn.

Range.—N.-W. Himalayas.

Palpi upturned, slender, the 2nd joint reaching vertex of head, the 3rd well developed and acuminate; maxillary palpi filiform; antennæ with long cilia. Forewing with the cell short; vein 3 from close to angle; 4, 5 stalked and curved downwards near base in male; 6 down curved; 7, 8, 9 on a long stalk and curved; 10 curved with a large glandular swelling on costa above it. Hindwing with vein 3 from close to angle of cell; 4, 5 shortly stalked; 6, 7 from upper angle; 8 free; the inner area clothed with long rough hair.

4438*a*. OMPHALOTA CHLOROBASIS, n. sp.

♂. Head, thorax and abdomen olive green variegated with black. Forewing with the basal half olive green irrorated with a few black scales; the outer half fuscous brown with a reddish tinge; a tuft of black scales below cell near, base an oblique sinuous antemedial black line; a postmedial minutely dentate line highly excurved from below costa to vein 2, where it is bent inwards and bounds the olive green area, its outer side defined by ochreous; cilia reddish and fuscous. Hindwing fuscous with traces of a pale curved postmedial line.


Omphalota chlorobasis. ♂ 1/1.

Habitat.—Simla. *Exp.* 21 mm. *Type.*—In coll. Rothschild.

Sect. I (bis), (*Macalla*). Palpi of male with the 2nd joint hollowed out to receive the brush-like maxillary palpi, the 3rd joint short; antennæ with very long thickly scaled process from basal joint.

4438*b*. MACALLA HYPOXANTHA, Hmpsn., Trans. Ent. Soc., 1896, p. 465.

♂. Head and thorax black with a few ochreous scales; abdomen wholly black. Forewing fuscous, the areas below basal part of median nervure, at apex and outer angle, tinged with rufous; an indistinct obliquely sinuous antemedial black line; large tufts of black scales in end of cell and on discocellulars; a minutely dentate black postmedial line oblique and defined by grey from costa to vein 4, where it is strongly angled, and angled inwards below vein 2. Hindwing ochreous, suffused with fuscous, especially on outer half; brownish ochreous below, the costa suffused with black.

Habitat.—Sikhim, 1,800′. *Exp.* 26mm.

4445*a*. MACALLA HYPNONALIS, n. sp.

♂. Maxillary palpi filiform; antennæ with short process from basal joint; forewing with glandular swelling on costa.

Head and thorax olive green and black; abdomen pale red-brown. Forewing with the basal costal and outer areas olive green and black; the medial area pale red-brown irrorated with dark red-brown and fuscous scales; an obscure pale waved antemedial line bounding the dark basal area; a dentate black postmedial line incurved below vein 2; a marginal series of black points; cilia vinous red. Hindwing pale, tinged with vinous red; an obilquely curved fuscous postmedial line, retracted at vein 2, then obsolescent; apical area black to vein 2; cilia vinous red.

Habitat.—Sikhim, 1,800′ (Dudgeon). *Exp.* 32mm. *Type.*—In British Museum.

Genus EPITAMYRA.

Epitamyra.—Rag. Ann. Soc. Ent. Fr. 1890, p. 503.

Provopera.—Warr. A. M. N. H. (6) xvii., p. 453 (1896).

Type.—*E. albomaculalis.* Moschl. from the West Indies.

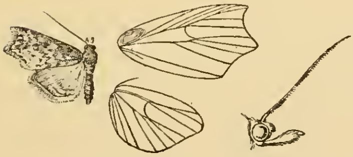
Range.—W. Indies; Assam.

Palpi rostriform, down curved, smoothly scaled and extending about twice the length of head; antennæ ciliated; tibiæ smoothly scaled. Forewing with the apex somewhat produced; the outer margin angled and falcate at vein 4; vein 3 from before angle of cell; 4, 5, from angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free; male with a glandular swelling fringed with long hair on base of costa below. Hindwing with the outer margin slightly angled at vein 2; vein 2 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle, 7 anastomosing with 8.

In the Typical species vein 10 of the forewing is stalked with 7, 8, 9.

4482*a*. EPITAMYRA VINOSALIS, Warr. A. M. N. (6) xvii, p. 454.

3. Head and thorax purplish red mixed with darker purple; abdomen fuscous, purplish red above. Forewing purplish red slightly irrorated with black and crossed by two irregularly waved ante and two similar postmedial red lines, with a white speck on costa; some fuscous suffusion from middle of cell to middle of outer margin; a prominent black discocellular spot; a series of black marginal specks; cilia whitish at tips. Hindwing fuscous with traces of dark postmedial and submarginal lines terminating at vein 2, where there is a pinkish patch on outer area; cilia pink from apex to vein 2.



Epitamyra vinosalis ♂ $\frac{1}{1}$.

Habitat.—Khásis. *Exp.* 22mm.

4492. ENDROTRICHA RUMINALIS.

Hindwing of male with a fold on inner area containing androconia.

4497*a*. ENDOTRICHA RUFOTERMINALIS. Chirst Bull-Mosc, lvi, p. 34; *Cangetta, venustalis* Warr., A. M. N. H. (6) xvii, p. 464.

♀. Head, thorax and abdomen whitish tinged with fuscous and brown. Forewing with the base pure white; the medial area fuscous grey, a triangular white postmedial patch from costa to vein 2 with a rufous line on its outer edge, the apical area beyond it being fuscous and bright rufous traversed by a series of dark rufous specks. Hindwing with the base white; the inner area fuscous; the outer part of cell and area beyond it bright rufous with a hyaline speck in the cell and bounded by a rufous line sharply angled on vein 2; some fuscous suffusion on postmedial area; the margin white.

Habitat.—Amur; Khásis. *Exp.* 16mm.

4499*a*. CANGETTA HOMOPERALIS, n. sp.

♀. Fuscous grey. Forewing with indistinct dark antemedial line angled on median nervure; a postmedial line with white mark inside in on costa and obtusely angled at middle; a dark marginal line. Hindwing with indistinct dark curved ante-and post-medial lines; a dark marginal line.

Habitat.—Puttalum, Ceylon (J Pole). *Exp.* 12mm. *Type.*—In British Museum.

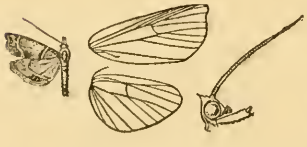
Genus DIPLOPSEUSTIS.

Diplopseustis, Meyr. Trans. Ent. Soc. 1884, p. 284.

Type.—*D. perieresalis*, Wlk.

Range.—Formosa; India; Perak; Australia; N. Zealand; Fiji.

Palpi porrect, the 2nd joint extending about twice the length of head and thickly scaled, the 3rd obliquely upturned and set on before the apex of the 2nd joint; maxillary palpi large and triangularly scaled; frons oblique; antennæ of male somewhat thickened and flattened; tibiæ with the outer spurs about half the length of inner. Forewing with the apex somewhat acute; the outer margin excised



Diplopseustis perieresalis ♂ 1/1

below apex; vein 3 from close to angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hindwing with the outer margin excised below apex; vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle.

4502*a*. DIPLOPSEUSTIS PERIERESALIS, Wlk. Cat. xix, p. 958.
Cymorixa minima, Butl. P. Z. S. 1880, p. 684.
Diplopseustis constellata, Warr. A. M. N. H. (6) xvii, p. 464.
Diplopseustis pallidalis, Warr., A. M. N. H., (6) xvii, p. 465.
Sufetula nana, Warr., A. M. N. H. (6), xviii, p. 225.

♂. Head, thorax and abdomen brown variegates with grey; palpi blackish at sides. Forewing fuscous brown with short dark striæ; some ochreous on basal half of inner area; a series of white specks on costa, two beyond middle forming semicircles; and sinuous white antimedial line defined by dark on outer side; a white discocellular spot with some specks beyond it; a submarginal white line excurved between veins 6 and 3; cilia with white tips; white lunules on margin above and below the excurved portion. Hindwing pale at base, fuscous towards margin; a sinuous white submarginal line from vein 5 to above anal angle.

♂. Much more uniform grey-brown with the white markings obscured.

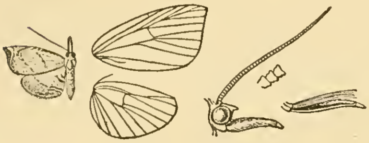
Habitat.—Formosa; Khásis; Bombay; Ceylon; Perak; Australia; N. Zealand; Fiji. *Exp.* ♂, 14, ♀, 22mm.

Genus TRIEROPIS.

Trieropis.—Meyr. Trans. Ent. Soc. 1886, p. 218.
Type.—*T. nesias*, Meyr.
Range.—Ceylon. Australian region.

Palpi porrect, rostriform, down curved, in male extending about four times length of head and hollowed out to receive the long tufted maxillary palpi, in female extending about three times length of head, the maxillary palpi triangularly scaled; frons produced to a flattened projection in male; antennæ thickened and annulate; tibiæ with the spurs long and even. Forewing with the apex produced to a point, the outer margin excurved at middle; veins 3, 4, 5 from angle of cell; 6 from upper angle; 7, 8, 9, 10, stalked; 11 free. Hindwing with veins 3, 4 from angle of cell; 5 from above angle; 6, 7 from upper angle.

4502*b*. TRIEROPIS NESIAS, Meyr. Trans, Ent. Soc. 1886, p. 218.



Trieropis nesias. ♂ $\frac{1}{1}$

Cretaceous white slightly tinged with fuscous. Forewing with indistinct curved fuscous subbasal line; a minutely waved antemedial curved line defined by clearer white on inner side; a white discocellular spot; a fine double curved postmedial line highly excurved beyond cell and oblique towards costa; traces of a fuscous submarginal line parallel to the postmedial line; a chestnut brown marginal band from apex to vein 3 defined by a fine black line on inner side. Hindwing with ante-and post-medial slightly curved and waved black lines, the area between them purer white; an indistinct line beyond the postmedial line and sinuous submarginal line ending at anal angle; a fine black marginal line.

Habitat.—Ceylon; Queensland; Tonga. *Exp.* 16 Mill.

4504*a*. TRICHOPHYSETIS METAMELALIS, n. sp.

♀. Head black; thorax whitish; abdomen ochreous. Forewing whitish suffused with golden yellow and with a cupreous tinge towards outer margin; traces of ante-and post-medial curved yellow lines. Hindwing with the base yellowish white; the medial area cupreous, the outer fuscous; indistinct fuscous antemedial and medial lines; cilia of both wings whitish with fuscous lines at base and middle.

Habitat.—Khásis. *Exp.* 20 Mill. *Type.* In British Museum.

4506*a*. TRICHOPHYSETIS FUMILAUTA, Warr., A. M. N. H. (6) xvii, p. 465.

White slightly suffused with fuscous; palpi blackish at sides; both wings with indistinct double ante- and post-medial fuscous lines, the latter slightly excurved beyond cell of forewing; forewing with large fuscous apical patch slightly tinged with fulvous at costa and with a fuscous-edged fulvous marginal band from costa to vein 5.

Habitat.—Khásis. *Exp.*, 14 mm.

4521. HYPSOPYGIA OLIVALIS, insert (*syn*) *Ulotrichodes novalis*, Warr., M. N. H., (6) xvii, p. 463, and transfer to genus *Lepidogma* of which it will form a section with no tuft on basal joint of antennæ; forewing with vein 7 from 8 after 9.

♂. Forewing more ochreous, the black suffusion confined to the area near lower part of postmedial line; hindwing whitish.

4546 *a*. STEMMATOPHORA RECTISECTALIS, Warr., A. M. N. H. (6) xvii, p. 460.

♂. Purplish flesh color slightly irrorated with black. Forewing with the base chocolate; a black discocellular speck; an almost straight indistinct pale postmedial line with the area beyond it rather darker; a marginal series of black spots. Hindwing with the base chocolate; a discocellular black speck; a pale curved postmedial line with black marks on its inner edge towards costa and two towards inner margin; a marginal series of black spots.

Habitat.—Pirmâd, Travancore. *Exp.* 28, mm.

4574*a*. TRIPHASSA ZONALIS, n. sp.

♂. Head, thorax and abdomen ochreous mixed with black scales, or mostly black with the base of abdomen ochreous. Forewing with the basal and outer areas ochreous irrorated with black, the medial area black, or almost entirely black; pale ante- and post- medial lines, the former obtusely angled on median nervure, the latter minutely waved and bent inwards below vein 2; a deep black discocellular lunule; a series of white specks on medial part of costa; a marginal series of prominent black points. Hindwing ochreous with minutely waved curved postmedial line; a marginal series of prominent black points and line through the cilia; the dark specimen with the veins of outer area streaked with black and a complete marginal line.

Habitat.—Khásis. *Exp.* 30, mm. *Type.*—In British Museum.

P. 167. Under *Hyboloma*, insert *Polycampsis*, Warr. A. M. N. H. (6) xvii. p. 457.

Sect. II. (*Polycampsis*). Forewing of male with a glandular swelling at base of costa below.

4579*a*. HYBOLOMA LONGINASUS, Warr. A. M. N. H. (6) xvii, p. 458.

♂. Head and thorax rufous and grey; abdomen fuscous black, greyish at extremity. Forewing with the basal and costal areas rufous, the rest of the wing fuscous suffused with purplish red; very obliquely curved pale lines from costa at middle and near apex to near base and middle of inner margin. Hindwing fuscous black; the outer area greyer.

Habitat.—Khásis. *Exp.*, 28, mm.

(*To be continued.*)

THE BIRDS OF NORTH CACHAR.

PART X.

By E. C. STUART BAKER, F.Z.S., M.B.O.U.

(*Continued from Page* 405 *of Vol. XI.*)

Order—GALLINÆ XII.

Sub-Order—ALECTOROPODES.

Family *Phasianidæ*.

(542) PAVO CRISTATUS.—The Common Peafowl.

Hume, No. 803 ; *Blanford, No.* 1324.

I see that Blanford says that there are no peafowl in Sylhet, Cachar or Manipur. On the extreme north and far up the Kopili on the north-east, the peafowl is very common and the young are often caught and domesticated by the Mikirs, and yet even more frequently the eggs are taken and hatched under hens. They are domesticated with the greatest ease, as long as both sexes are kept, and become extremely tame.

(543) PAVO MUTICUS.—The Burmese Peafowl.

Hume, No. 804 ; *Blanford, No.* 1325.

In 1888, five eggs were brought to me by a Mikir who said they were the eggs of a peafowl different to the common sort. He described the birds as having straight horns, and said that the Mozedar had some of the same kind tame. I went to see this man, Jeng Mikir, who was the head of the Mikirs in North Cachar, and saw his peafowl which were undoubted specimens of the Burmese birds. I then went after the owners of the eggs which had been brought to me and succeeded in shooting the male, a fine specimen of *muticus*. This is the only specimen I have ever shot ; all others being the common *cristatus*. Jeng could give me no details as to where his were caught ; but says that they belonged originally to his grandfather and had been caught at a time when peafowl were common all over Cachar and Manipur, wherever the ground was suitable. I have heard of peafowl being seen on the high grass up lands north of Imphal, but cannot say whether the reports were true or not.

(544) POLYPLECTRUM CHINQUIS.—The Grey Peacock-Pheasant.

Hume, No. 803 *quat* ; *Blanford, No.* 1327.

Common all over the lower hills and well into the plains. They breed in March, April and May, laying from two to six eggs, generally four or five, just like those of the common fowl but more rich in hue. Many I have taken could have been paired with richly coloured eggs of the Cochin-China fowl. As a rule they are much pitted and in some eggs these pits are filled up with a chalky stuff, giving the egg a look as if freckled with white. During the breeding season it may be heard constantly uttering a deep chuckle as it runs about in the undergrowth, from which it is very difficult to dislodge even with the help of dogs. It is a slow heavy flier until it gets some distance on the wing, when its pace increases and it swoops down the sides of the hills with no little velocity.

My eggs vary from 1·92″ to 2·17″ in length and from 1·44″ to 1·52″ in breadth. They are laid on a few leaves and rubbish, collected in some small hollow in a ravine, and are always placed where the undergrowth is very dense.

(545) GALLUS FERRUGINEUS.—The Red Jungle Fowl.

Hume, No. 812 ; *Blanford, No.* 1328.

Very common indeed. Here they lay from four to eight eggs, generally four or five, rarely more than six.

(546) GENNAEUS HORSFIELDI.—The Black-breasted Kalij-Pheasant.

Hume, No. 810 *ter* ; *Blanford, No.* 1339.

Very common all over the hills up to about 3,500 feet, above which they are rare, though they may occasionally be found on the highest peaks. They breed from the end of March up to the middle of May and lay four or five eggs, sometimes six or seven.

(547) TRAGOPAN BLYTHI.—The Grey-bellied Horned Pheasant.

Hume, No. 806 *bis* ; *Blanford, No.* 1346.

Only once have I seen this fine pheasant in North Cachar, when I had the pleasure of watching two feeding for some time. It was early in April and the cock bird was busy courting the hen who refused all advances. They behaved exactly like domestic fowls and the cock kept running round the female with trailing wing.

This pheasant extends right through Manipur into the Lushai and Northern Burmese hills and again up to Debrughur on the other side. It keeps to high ranges and is very rarely met with below 5,000 feet.

Last March, after numerous fruitless attempts I at last succeeded in obtaining nine fine specimens of this beautiful pheasant. I am now therefore able to give descriptions of the young male and female, the which have hitherto been desiderata.

Young male.—Like the female, changing in the spring to a plumage half way between that of the adult male and that of the female.

A fine young male in my collection has the forehead to nape deep glossy black, the lores covered with feathers, white near the eye, black next the forehead edged with reddish ; a broad supercilium from above the eye red ; nape and hind neck vermiculated brown and black ; a broad band from behind the eye and below the supercilium black ; ear coverts dark brown with a few white specks ; chin and throat thinly covered with mottled white and brown feathers ; lower throat and upper breast as in the adult ; lower breast and under plumage like that of the female but with many feathers having the centres *turning grey ;* the upper plumage is like that of the female, but darker and more boldly speckled, many of the feathers of the scapulars and interscapulars having dull chestnut-brown eyes and these are scattered here and there, also, over the whole surface.

Irides dark brown ; legs dull reddish, the rudiments of spurs paler. Gular skin dull orange shewing through the feathers; round the lids livid, livid fleshy above the eye. Bill horny, culmen darker, gape and maxilla paler and rather fleshy in tint.

Female.—Whole upper plumage mottled black and rufous, the black being in broad bold bars and patches, the rufous in narrow bars and minute stippling; in addition nearly all the feathers have a V shaped or crescentic central mark of buff, a few feathers have two such marks and a few also have longitudinal marks of the same colour. The tail is lighter in general effect and has the black replaced to a great extent by rich rufous ; chin and throat white, with brown spots, the former almost or quite immaculate ; whole lower surface and flanks, mottled and stippled very dark brown, dull rufous and greyish white, the latter colour forming distinct spots on many feathers ; the centre of the abdomen and the vent are more grey and uniform in colour, the under tail coverts rather more rich and deep coloured.

Bill dark horny, commissure and gape paler; legs dull fleshy horny ; claws darker and browner; irides brown.

(548) BAMBUSICOLA FYTCHII.—The Western Bamboo-Partridge.

Hume, No. 825 *quint.* ; *Blanford, No.* 1352.

This is a common partridge all over the North Cachar Hills at elevations of 2,500 feet and over, descending to 2,000 feet, but seldom below that. It does not keep to tree and bush jungle as does *arboricola* and is seldom found far from open land of sorts, preferring bamboo and scrub jungle on the borders of rice-fields or patches of grass. Early in the morning it is one of the first birds to rise ; it comes into the open to feed, scratching for seeds and insects like other partridges. Except during the breeding season it is found in coveys consisting of the old birds and the last brood of young. About March the young go off on their own hook and the cock bird begins to get extremely noisy. The very earliest glimmer of dawn sees him perched on some stump or bush crowing away for all he knows, his cry being much like that of the black partridge, only less shrill and high pitched. It might be syllableized—Che-chirree—che-chirree, chirree chirree chirree. Before laying her eggs the female also sometimes attempts to call. I watched a pair for some time once on the peak of a hillock close to my house. There were a few young trees and some bushes standing in long grass and every few minutes the cock bird would fly on to one of these, making a tremendous commotion with his wings, crow two or three times and then drop to the ground, where after a little " walk round" he would subside into the grass. After every two or three of these exhibitions the hen would jump up, give utterance to a few discordant squawks and retire again to give place to her husband.

They fly very well and get up quickly and are at once away ; are much easier to flush than are the partridges of the genus *arboricola*, and sometimes give quite good shooting when the hill rice has been cut and the birds frequent the edges of the jhums.

They lay principally in April, but I have had eggs brought to me in March and again as late as July. The nest is placed in high grass, the birds collecting a good deal of rubbish and leaves together and placing them in some natural hollow. Now and then the nest may be taken in bush jungle and more often in bamboo.

The eggs number from four to six or seven, five being, I think, the number most often found. In colour they vary from a pale, dull buff to buff of a warm tint, nearly always dull and brownish but sometimes with rather a pink tinge. In shape they are normally rather broad ovals decidedly compressed towards the smaller end which is often pointed, some eggs are rather longer and narrower, and a few are broad blunt ovals. The texture is coarse and very hard, the surface rather rough and sometimes pimply and the shell wonderfully strong, quite as hard as that of a jungle fowl and less brittle. I have one clutch which shows a slight gloss ; this is less rough than the others and closer and finer in texture.

My eggs are on an average 1·67″ × 1·10″, the longest and shortest being respectively 1·82″ and 1·50″, whilst the broadest and narrowest measure 1·25″ and 1·02″.

(549) EXCALFACTORIA CHINENSIS.—The Blue-breasted Quail.
Hume, No. 831 ; *Blanford, No.* 1354.

Common in the cold weather in the plains, less so in the rains, though a good number breed in the district. Does not ascend the hills.

(550) COTURNIX COMMUNIS.—The Common Quail.
Hume, No. 829 ; *Blanford, No.* 1355.

A decidedly rare bird only occurring now and then as a straggler.

(551) C. COROMANDELICA.—The Black-breasted or Rain-Quail.
Hume, No. 830 ; *Blanford No.* 1356.

Decidedly less rare than the Grey Quail, but still by no means common. I have seen three or four, perhaps even more than this, in a day's snipe shooting about the Regimental and Police firing ranges in Silchar. Nowhere else have I seen more than one or two at a time.

(552) PERDICULA ASIATICA.—The Jungle Bush-Quail.
Hume, No. 826 ; *Blanford, No.* 1357.

By no means rare during the cold weather and perhaps no more so during the rains though less seen.

(553) ARBORICOLA TORQUEOLA.—The Common Hill Partridge.
Hume, No. 824 ; *Blanford, No.* 1362.

This Hill Partridge is decidedly rare ; a few specimens may be found on the higher parts of the Barail Range close to the Naga Hills and Manipur.

The eggs are generally five in number, sometimes six.

(554) A. RUFIGULARIS.—Blyth's Hill Partridge.
Hume, No. 825 ; *Blanford, No.* 1363.

It is almost impossible to say what birds are *rufigularis* and what intermedia. I have a pair in my collection of which the male is a typical *intermedia*, the female an equally typical *rvfigularis* and has the throat and chin rufous to the extreme point, though heavily spotted with black. Birds, however, with the black border below the rufous throat are very rare, and I have only seen two such.

The nestling in down is rather bright chestnut brown above, dingy white below ; supercilium and cheeks paler, a dark brown line behind the eye dividing into two.

The next plumage has the upper parts as in the adult, but duller, with the crown vermiculated, not spotted, with black. The sides vermiculated brown and black and the centre of breast and abdomen paler and whitish.

The adult bird has the soft parts coloured. Irides brown ; orbital skin, gular skin and gape red ; bill black ; legs red, claws paler. The female has the legs a yellower red than the male.

On the higher peaks over 4,500 feet this partridge is fairly common, but I have seen it nowhere below 3,800 feet, and it is very rare even there. At Hungrum on the peaks at about 5,000 to 6,000 feet, its cheerful call may be heard regularly in the early mornings during the breeding season, but it keeps so much to bush and scrub jungle in forest that it is not easy to procure specimens.

The only three eggs I possess were taken on the second of July, 1888, and are probably rather abnormally small ; they measure 1·48″ × 1·14″, 1·45″ × 1·14″ and 1·41″ × 1·11″. They are of the usual character, broad ovals, considerably compressed towards the smaller end which is pointed in two, blunter in the third. The pure white shell is smooth and very close in texture with a decided gloss.

(555) A. INTERMEDIA.—The Arrakan Hill Partridge.

Hume, *No.* 825 *ter* ; *Blanford*, *No.* 1364.

I possess one clutch of eggs of this species taken at Laisung in mixed bramble and bamboo jungle, on the steep banks of a stream running through a very deep valley at an altitude of over 4,000 feet. The eggs, five in number, are larger than any others I have ever seen of the genus *Arboricola*. Except in measurements they resemble those of *A. rufigularis* just described, perhaps being rather longer in proportion to their breadth. They measure 1·70″ × 1·23″ ; 1·68″ × 1·25 ; 1·66″ × 1·22″ ; 1·65″ × 1·25″ and 1·61″ × 1·22″.

The nest consisted merely of a mound of leaves, &c., with a small hollow in the centre.

(556) A. ATRIGULARIS.—The White-cheeked Hill Partridge.

Hume, No. 824 *ter*; *Blanford, No.* 1365.

Extremely common from the plains up to 3,000 feet, above which it is much less common, and over 4,000 feet it is rare.

It should be noted also that in the breeding season the skin of the head, neck and throat is far more vivid than at other times. Again, the males can be told at a glance from the females by the color of the legs, which in the former varies from dull orange to a bright red orange whereas in the latter the color is a pale dull wax yellow to a rather dark wax yellow, never very bright. A series of 80 eggs averaged 1·45″ × 1·12″. The longest and widest being 1·51″ and 1·18″ respectively, and the shortest and narrowest 1·38″ and 1·08″. All eggs have a certain amount of gloss, some are very glossy, and the texture is fine and close.

The number laid is most often five, frequently only four, sometimes six and very rarely more, though I have taken seven.

(557) FRANCOLINUS VULGARIS.—The Black Partridge.

Hume, No. 815; *Blanford No.* 1372.

Common in north-east of North Cachar, not found in the south plains at all.

(558) F. GULARIS.--The Kyah or Swamp Partridge.

Hume, No. 823 ; *Blanford, No.* 1376.

The Kyah is very common throughout the plains of Cachar in suitable localities, but does not ascend the hills at all.

Order XIII—HEMIPODII.

Family *Turnicidæ.*

(559) TURNIX PUGNAX.—The Bustard Quail.

Hume, Nos. 832 and 833 ; *Blanford, No.* 1382.

One of the most common birds in N. Cachar; it is hardly possible to walk along the less frequented paths without putting up two or three pairs.

The female utters a loud booming call which can be heard at a very great distance.

I must have taken five hundred nests of this quail and not in four cases have I found more than four eggs—I twice took five and once had six brought to me—so that in N. Cachar at least four may be put down as the almost invariable number.

(560) T. DUSSUMIERI.—The Little Button-Quail.
Hume, No. 835 ; *Blanford, No.* 1383.

Less common than the last, still very far from rare.

(561) T. BLANFORDI.—The Burmese Button-Quail.
Hume, No. 834 *bis*; *Blanford, No.* 1386.

Fairly common. The eggs, of which I have many, are undistinguishable from those of *T. pugnax* and like them *always* four in number.

Order XIV—GRALLÆ.

Sub-order—FULICARIÆ.

Family *Rallidæ*.

(562) HYPOTÆNIDIA STRIATA.—The Blue-breasted Banded Rail.
Hume, No. 913; *Blanford, No.* 1389.

One of the most common of Cachar water-birds. It ascends the hills up to nearly 3,000 feet.

(563) PORZANA PUSILLA.—The Eastern Baillon's Crake.
Hume, No. 910 ; *Blanford, No.* 1393.

I have not seen many specimens of this little crake in Cachar, but am told that it is very common in some localities.

(564) RALLINA SUPERCILIARIS.—The Banded Crake.
Hume, No. 912 ; *Blanford, No.* 1395.

Rare and such a skulker that it appears even more so than it really is. It breeds in N. Cachar and I captured a hen bird with one young one on the nest, a pile of loose grass with a deep cup in the centre.

(565) R. FASCIATA.—The Malayan Banded Crake.
Hume, No. 912 *bis* ; *Blanford, No.* 1396.

I have one female which must, I think, be put down to this species. It was caught in my bearer's house in which it had taken refuge during a very high wind.

(566) AMAURORNIS FUSCUS.—The Ruddy Crake.
Hume, No. 911 ; *Blanford No.* 1398.

Common in Cachar and ascends the hills up to 3,000 feet.

(567) A. AKOOL.—The Brown Crake.
Hume, No. 908 ; *Blanford, No.* 1400.

I have two skins of this bird which were obtained on the Chutla bheel, a large swamp quite close to Silchar.

(568) A. PHŒNICURUS.—The White-breasted Water-hen.
Hume, No. 907 ; *Blanford, No.* 1401.

Very common indeed.

(569) GALLINULA CHLOROPUS.—The Moor-hen.
Hume, No. 905 ; *Blanford, No.* 1402.

Equally common in the rains, but many move to Sylhet in the end of the cold weather when the swamps dry up.

(570) GALLICREX CINEREA.—The Water-cock.
Hume, No. 904 ; *Blanford No.* 1403.

Common on all the larger pieces of bheel or swamp. Lays as many as nine or even ten eggs.

(571) PORPHYRIO POLIOCEPHALUS.—The Purple Coot.
Hume, No. 902 ; *Blanford, No.* 1404.

Only found on the larger pieces of water and is very local even on these. Most birds wander away to Sylhet at the end of the cold weather for two months or so.

Family *Heliornithidæ.*

(572) HELIOPAIS PERSONATA.—The Masked Finfoot.
Hume, No. 903 *bis*; *Blanford, No.* 1406.

Extremely rare. I have never seen it.

Family *Gruidæ.*

(573) GRUS ANTIGONE.—The Sarus.
Hume, No. 863 ; *Blanford, No.* 1409.

I once saw a pair of these cranes near Hailakandy during the cold weather of 1894. They settled in a field for a few minutes and then sailed away out of sight towards the south. I have never heard of any others being seen.

(574) G. MONARCHUS.—The King Crane.

In December of 1889 whilst fishing in the Mahar River, seven huge cranes flapped overhead down the stream and settled in a shallow pool some four hundred yards away. They at once struck me as being something I had not seen before, and I followed them up, and though I failed to bring my bird down with the first barrel I knocked one over as they rose with the second. He half fluttered and half ran down the stream, and it took a third barrel to bring him to bag; but when it was at last brought to hand I found myself in possession of an undoubted *G. monarchus*. The anterior crown was black, otherwise the whole head and neck were white. The brown margins to the feathers of the upper part made the plumage appear to be a brown-grey.

The wing measured full 20″. The lengthened inner secondaries were not very long or drooping and the bird conveyed the impression that it was a young one. The skin has not been kept. I was three days from head-quarters, but I thought special messengers would get it in in time to skin, but alas when I arrived three days later I found it had not been brought in, and the messenger, when questioned, said, " Oh, it began to smell, so I threw it away." I do not think, however, that there was, or is, any doubt whatsoever as to the identification being correct, and *G. monarchus* must be added to our Indian avifauna. Humes' surmise as to the identity of the birds he saw (" Stray Feathers," XI) was very likely correct. The most striking thing about those I saw was the white head and brown-toned upper parts.

Sub-Order—OTIDES.

Family *Otitidæ.*

(575) SYPHEOTIS BENGALENSIS.—The Florican.

Hume, No. 858 ; *Blanford, No.* 1417.

Only occurs as a straggler. I flushed a hen once about five miles from Silchar and have seen two or three on the borders of the Naogaon District in the mustard fields bordering the Khopili.

Order XV—LIMICOLÆ.

Family *Œdicnemidæ.*

(576) ŒDICNEMUS SCOLOPAX.—The Stone-Curlew.

Hume, No. 859 ; *Blanford, No.* 1418.

A very rare bird I believe in Cachar, but rather less so in the next district, Sylhet.

(577) ESACUS RECURVIROSTRIS.—The Great Stone-Plover.

Hume, No. 858 ; *Blanford, No.* 1419.

Recorded from the plains of Cachar. I have never met with it.

Family *Glareolidæ.*

Sub-Family *Cursoriinæ.*

(578) CURSORIUS COROMANDELICUS.—The Indian Courser.

Hume, No. 840 ; *Blanford, No.* 1422.

I saw half-a-dozen of these coursers once when shooting on the Chutla bheel, about six miles from the station of Silchar.

Sub-Family *Glareolidæ.*

(579) GLAREOLA ORIENTALIS.—The Large Indian Swallow-Plover.

Hume, No. 842 ; *Blanford, No.* 1425.

I have seen but one specimen of this Swallow-Plover, a female shot by one of my collectors in Cachar, in December, 1897.

(580) GLAREOLA LACTEA.—The Small Indian Swallow-Plover.

Hume, No. 843 ; *Blanford, No.* 1427.

Occasionally met with in the plains of Cachar, but never, I think, at all common.

Family *Parridæ.*

(581) METOPIDIUS INDICUS.—The Bronze-winged Jacana.

Hume, No. 900 ; *Blanford, No.* 1428.

Extremely common throughout Cachar, and may also be found sometimes at considerable elevations. I saw two birds at Kurrangma, an artificial lake at an altitude of over 3,000 feet, and I have also seen one or two about the swamps on the high uplands about the Hot Springs.

This bird is credited by different observers with laying from four to ten eggs. Out of some hundred nests I have taken the vast majority contained four eggs, very rarely five only, once or twice six. I had one nest taken from bushes about twenty yards from the nearest tank.

(582) HYDROPHASIANUS CHIRURGUS.—The Pheasant-tailed Jacana.

Hume, No. 901 ; *Blanford, No.* 1429.

Far less common than the last bird and, undoubtedly, locally migratory. A good many are met with on the larger bheels during the rains, but nearly all leave during the cold weather, most I expect to Sylhet, where they are common all the year round.

The eggs are almost invariably four in number. A very fine series I possessed before the earthquake of 1896 showed almost every shade of color between a pale stone green to a deep, almost black, bronze-brown. The commonest color was a bronze-brown, rather dark and often more so at the larger end than at the other.

Family CHARADRIIDÆ.

Sub-Family *Charadriinæ.*

(583) STREPSILAS INTERPRES.—The Turnstone.

Hume, No. 860 ; *Blanford, No.* 1430.

A friend from Cachar has reported this bird as having been shot by him. I have never met with it, and he has seen it on no other occasion.

(584) Sarcogrammus indicus.—The Red-wattled Lapwing.

Hume, No. 855 ; *Blanford No.* 1431.

Not uncommon in the plains of Cachar.

(585) S. atrinuchalis.—The Burmese Wattled Lapwing.

Hume, No. 855 *bis* ; *Blanford, No.* 1432.

I have one specimen of a Wattled Lapwing in my collection which has a black collar round the neck, but it is very dilapidated and the nape much injured. It however belongs, I think, to this species and not the last. Its occurrence in Cachar is of course very probable as the Burmese form is the one found in Manipur; and intermediate specimens are almost sure to occur now and then.

(586) Sarciophorus malabaricus.—The Yellow-wattled Lapwing.

Hume, No. 856 ; *Blanford, No.* 1433.

This Lapwing has been reported to me from the extreme north of the district where it debouches on the Brahmaputra Valley.

(587) Microsarcops cinereus.—The Grey-headed Lapwing.

Hume, No. 854 ; *Blanford, No.* 1434.

Not uncommon during the cold weather.

(588) Hoplopterus ventralis.—The Indian Spur-winged Plover.

Hume, No. 857 ; *Blanford, No.* 1435.

An extremely common bird everywhere and also an extremely objectionable one. Going down streams in boats the would-be sportsman is constantly having shots spoilt by their noisy cries, which alarm everything within two or three hundred yards. They breed here in February or early March.

(589) Charadrius fulvus.—The Eastern Golden Plover.

Hume, No. 845 ; *Blanford, No.* 1439.

Very common indeed.

(590) Squatarola helvetica.—The Grey Plover.

Hume, No. 844 ; *Blanford, No.* 1441.

I shot one of these birds once out of a flock of Golden Plover, killing two of the latter by the same shot. This is the only time I have met with the Grey Plover in Assam, nor have I any other record of its having occurred anywhere else in the Province.

(591) Ægialitis mongolica.—The Lesser Sand-Plover.

Hume, No. 847 ; *Blanford, No.* 1443.

A decidedly rare visitor to Cachar.

(592) Æ. ALEXANDRINA.—The Kentish Plover.

Hume, No. 848 ; *Blanford, No.* 1446.

I have seen but one specimen of this little Plover, but should imagine it must occur fairly often.

(593) Æ. DUBIA.—The Little Ringed Plover.

Hume, Nos. 849, 850 ; *Blanford, No.* 1447.

Common.

In my collection there is a tiny Swallow Plover which differs from *dubia* in having no signs of any ring on the nape of the neck, either white or dark. This is probably only an abnormally coloured specimen. Young birds of course often show very little signs of the ring, but this bird appears adult and there is absolutely no trace of it.

(594) Æ. PLACIDA.—The Long-billed Ring Plover.

Hume, No. 848 *bis* ; *Blanford, No.* 1449.

Recorded from Assam and Cachar. I have never come across any.

Sub-Family *Hæmatopodinæ.*

(595) HIMANTOPUS CANDIDUS.—The Black-winged Stilt.

Hume, No. 898 ; *Blanford, No.* 1451.

Very common. I found some of these birds on the river Kopili in April, and believe they were breeding. The testes of the males were fully enlarged and the ovaries of one female contained eggs the size of a thrush's.

(596) IBIDORHYNCHUS STRUTHERSI.—The Ibis-bill.

Hume, No. 879 ; *Blanford, No.* 1453.

I have a specimen of this rather rare bird shot by one of my collectors in the plains of Cachar. Have shot two in the highest waters in N. Cachar and seen two or three others.

Sub-Family *Totaninæ.*

(597) NUMENIUS ARQUATA.—The Curlew.

Hume, No. 877 ; *Blanford, No.* 1454.

I once heard a flock of these birds flying overhead, appearing to have come from Manipur. I have never seen any other birds, nor have I heard of any being obtained in Cachar, but I have records of their being shot both in Manipur and in Sylhet.

(598) LIMOSA BELGICA.—The Black-tailed Godwit.

Hume, No. 875 ; *Blanford, No.* 1456.

A very rare visitor to Cachar. I have never seen a living specimen thence.

(599) Totanus hypoleucus.—The common Sandpiper.
Hume, *No.* 893 ; *Blanford*, *No.* 1460.

Very common.

(600) T. glareola.—The Wood Sandpiper.
Hume, *No.* 891 ; *Blanford*, *No.* 1461.

Common, but not nearly as numerous as the last.

(601) T. ochropus.—The Green Sandpiper.
Hume, *No.* 892 ; *Blanford*, *No.* 1462.

Common.

(602) T. stagnatilis.—The Little Green Shank.
Hume, *No.* 895 ; *Blanford*, *No.* 1463.

This is, I think, a rather rare sandpiper in Cachar. I have only one specimen in my collection, but have doubtless overlooked very many when shooting snipe.

(603) T. calidris.—The Red Shank.
Hume, *No.* 897 ; *Blanford*, *No.* 1464.

A not rare visitor to Cachar, where a few may nearly always be got by any one wanting them.

(604) T. fuscus.—The Spotted Red Shank.
Hume, *No.* 896 ; *Blanford*, *No.* 1465.

I have several specimens of this Red Shank shot by my collectors in Cachar, but have, strange to say, come across none myself. I do not think it can be at all rare.

(605) T. glottis.—The Green Shank.
Hume, *No.* 894 ; *Blanford*, *No.* 1466.

Very common indeed.

(606) Pavoncella pugnax.—The Ruff ♂, Reeve ♀.
Hume, *No.* 880 ; *Blanford*, *No.* 1468.

I once saw three Reeves on the Masimpore bheel in Cachar. I saw no Ruff ; and these three Reeves were not seen again.

(607) Tringa minuta.—The Little Stint.
Hume, *No.* 884 ; *Blanford*, *No.* 1471.

Common.

(608) T. temmincki.—Temminck's Stint.
Hume, *No.* 885 ; *Blanford*, *No.* 1474.

This is the most common form of Stint found in Sylhet and Cachar and is often seen in very considerable flocks, as well as in pairs and singly.

Sub-Family *Scolopacinæ*.

(609) SCOLOPAX RUSTICULA.—The Woodcock.

Hume, No. 867 ; *Blanford, No.* 1482.

I have obtained nearly a dozen Woodcock in the N. Cachar Hills, but even there they are not common, far less so than in the adjoining Naga Hills and Khasia Hills. Mr. St. J. Hickman shot a Woodcock in the plains near Silcoorie ; two were shot by natives in a small bheel just behind the station, I missed one near the rifle butts, and another was shot by a planter, I forget whom, near Silcoorie.

(610) GALLINAGO CŒLESTIS—The Common Snipe.

Hume, No. 871 ; *Blanford, No.* 1484.

Common.

(611) G. STENURA—The Pintail Snipe.

Hume, No. 870 ; *Blanford, No.* 1485.

As might be imagined from their breeding distribution, the first snipe to arrive are the Pintails. The first few of these are in by August the 15th about, where as few Fantail will be shot before the end of September and even then in far less numbers than the Pintail. In comparison with other provinces Assam is a bad place for snipe, and any bag of over 20 couple is good for one gun and anything over forty very exceptional.

As regards their breeding, I am afraid that my notes on the subject must have conveyed rather a wrong impression, for Mr. Blanford writes :—" Both Mr. Baker and Mr. Hole state that snipes breed regularly in Cachar." I certainly do not think that they do so *regularly*, but at the same time I, equally certainly, think that very often an odd couple or two remain in the plains to breed. Mr. Hole sent me the eggs he collected, and the greater number of these were eggs of the painted snipe, but one clutch of three and one odd egg were without doubt snipes' eggs, whether *cœlestis* or *stenura*, I cannot say. Of the Pintail snipe I have one authenticated clutch taken behind the butts on the Silchar Military range and one taken by myself in the ditch of the abandoned stockade at Guilang. In this latter case two Pintail snipe were trapped by some Nagas and a search in the ditch where they had been trapped soon brought a nest and four eggs to light. A hen Pintail with a fully-formed egg in her ovary was shot on the Silchar Rifle Range and dissected by the late Dr. Evans, then attached to the regiment stationed there.

As regards Fantail, I have no authenticated clutches from Cachar, but I have two from the Santhal Parganas in Bengal.

(612) G. SOLITARIA.—The Himalayan Solitary Snipe.

Hume, No. 869 ; *Blanford, No.* 1486.

I shot a pair of these birds in July 1888 on a small bheel near the source of the Mahor river. I am sure they had a nest, but a most patient and careful search failed to find it. I have had two or three reports of its having been shot at the foot of the hills in winter, but cannot be sure that the birds were correctly identified and they may have been *G. nemoricola.*

(613) G. GALLINULA.—The Jack Snipe.

Hume, No. 872 ; *Blanford, No.* 1487.

Sometimes very common, at other seasons very rare. I have shot all through a season and only got two or three birds ; yet another, the next year, I have shot eight in one day. Captain Melville, of the 4th Rajpoots, and I shooting on the Silcoorie bheels on three consecutive days must have got an average of 10 a day between us, amongst the 94 couple we obtained.

I have never noticed the Jack Snipe on these hills during migration, whereas the Pintail is almost common at times.

(614) ROSTRATULA CAPENSIS.—The Painted Snipe.

Hume, No. 873 ; *Blanford, No.* 1488.

Very common. Mr. A. H. Hole found this snipe breeding in July and August and laying their eggs in ploughed fields. I have had their eggs brought to me in December and often as late as October ; as on the other hand, I have often got them in May and June ; it would seem certain that they must have at least two broods in the year.

Order XVI—GAVIÆ.

Family LARIDÆ.

Sub-Family *Larinæ.*

(615) LARUS RIDIBUNDUS.—The Laughing Gull.

Hume, No. 981 ; *Blanford, No.* 1490.

I have a single specimen of this gull shot in Hailakandy and given to me by Mr. Inglis. I have seen no others, and it must be very rare.

(616) LARUS BRUNNEICEPHALUS.—The Brown-headed Gull.

Hume, No. 980 ; *Blanford, No.* 1491.

A decidedly rare gull in Cachar, though common enough in Sylhet on the one side and Manipur on the other.

Sub-Family *Sterninæ.*

(617) HYDROCHELIDON HYBRIDA.—The Whiskered Tern.

Hume, No. 984 ; *Blanford, No.* 1496.

Very common indeed ; breeds in the larger jheels and waters of Cachar.

(618) STERNA SEENA.—The Indian River-Tern.

Hume, No. 985 ; *Blanford, No.* 1503.

Very numerous on the larger rivers and open pieces of water during the rains, less so during the cold weather after December.

(619) S. MELANOGASTER.—The Black-bellied Tern.

Hume, No. 987 ; *Blanford, No.* 1504.

A rare bird, much more common in the adjoining district of Sylhet.

Sub-Family *Rhynchopinæ.*

(620) RHYNCHOPS ALBICOLLIS.—The Skimmer.

Hume, No. 994 ; *Blanford, No.* 1517.

In most years very rare, but in 1897 very numerous and in 1896 almost equally so. In these two years my collectors obtained a great number, and they seem to have been distributed freely over the whole of the Surma Valley.

Order XVII—STEGANOPODES.

Family PELICANIDÆ.

(621) PELECANUS ROSEUS.—The Eastern White Pelican.

Hume, No. 1003 ; *Blanford, No.* 1520.

A very rare visitor as a rule to Cachar, sometimes however appearing in small numbers.

(622) P. PHILIPPENSIS.—The Spotted-billed Pelican.

Hume, No. 1004 ; *Blanford, No.* 1523.

A regular visitor in large, sometimes immense, flocks.

Family PHALACROCORACIDÆ.

Sub-Family *Phalacrocoracinæ.*

(623) PHALACROCORAX CARBO.—The Large Cormorant.

Hume, No. 1005 ; *Blanford, No.* 1526.

Fairly common.

(624) PH. FUSCICOLLIS.—The Indian Shag.

Hume, No. 1006 ; *Blanford, No.* 1527.

Rather more common than the last in the plains, but less so in the hills.

(625) PH. JAVANICUS.—The Little Cormorant.

Hume, No. 1007 ; *Blanford, No.* 1528.

This is the common kind of Cormorant everywhere from the plains to the sources of the highest streams. Here it is almost always met with in flocks, often numbering as many as two hundred and sometimes even more than that.

Sub-Family *Plotinæ.*

(626) PLOTUS MELANOGASTER.—The Snake-bird or Darter.

Hume, No. 1008 ; *Blanford, No.* 1529.

Nowhere very numerous, is distributed alike over hills and plains everywhere where there is water, still or running, in small numbers. No author seems to have noticed the peculiar wavy appearance of the scapulars and inner secondaries, which gives them a look as if they had been crinkled. This is not noticeable in birds in inferior plumage but is very conspicuous in newly-moulted birds during the breeding season.

Family PHAËTHONIDÆ.

(627) PHAËTHON FLAVIROSTRIS.—The White Tropic-bird.

Hume, No. 997 ; *Blanford, No.* 1534.

A single straggler of this species caught by Inglis on the Barak in Cachar is the sole record of a Tropic-bird occurring in Assam, nor is it likely to ever occur again.

Order XVIII—HERODIONES.

Sub-Order—PLATALEÆ.

Family *Ibididæ.*

(628) IBIS MELANOCEPHALA.—The White Ibis.

Hume, No. 941 ; *Blanford, No.* 1541.

Rather an uncommon bird, and I have obtained very few, either myself or through my collectors.

(629) PLEGADIS FALCINELLUS.—The Glossy Ibis.

Hume, No. 943 ; *Blanford, No.* 1544.

Fairly common, resident and breeds. In the extreme south of the district I am told it is very common.

Sub-Order—CICONIÆ.

Family *Ciconiidæ*.

(630) CICONIA NIGRA.—The Black Stork.

Hume, No. 918 ; *Blanford, No.* 1547.

I have one specimen, a fine male, shot by my collectors on the Chutla bheel and said to have been one of a flock of seven. I have not seen any of this species in Cachar myself.

(631) DISSURA EPISCOPUS.—The White-necked Stork.

Hume, No. 920 ; *Blanford, No.* 1548.

This Stork is not very rare in Cachar, where yearly a few individuals may be met with. In this district it seems generally to be found either singly or in pairs. I have seen no flocks.

(632) XENORHYNCHUS ASIATICUS.—The Black-necked Stork.

Hume, No. 917 ; *Blanford, No.* 1549.

Occurring, much like the last, in suitable localities in Cachar.

(633) LEPTOPTILUS DUBIUS.—The Adjutant.

Hume, No. 915 ; *Blanford, No.* 1550.

By no means uncommon, and some years occurs in very large numbers.

(634) LEPTOPTILUS JAVANICUM.—The Lesser Adjutant.

Hume, No. 910 ; *Blanford, No.* 1551.

This is the common Adjutant of Cachar and is resident and breeds. The site selected seems generally to be some cluster of large trees on one of the " tilas " in the broken ground at the foot of the hills. Here they build in company and a dozen or twenty nests may be found together, huge platforms of sticks and branches, often placed at great heights from the ground. The normal number of eggs appears to be two, rarely three and sometimes only one. I have a fine series of eggs, nearly all of which I owe to the generosity of Mr. H. A. Hole, who had a colony of these birds breeding on the estate he was managing.

These eggs are much the same as those of *L. dubius* in texture, *i.e.*, coarse and rough with a surface much pitted and rather inclined to be chalky. Originally white, they are all much stained and smeared. The shape is generally a very regular broad oval ; one I have is almost spherical, two rather long and compressed towards the smaller end and one is quite pointed.

My smallest egg is 2·28″ × 1·9″ and they run in length up to 3·32″ and in breadth up to 2·38″, and 20 average 2·94″ × 2·2″. All the eggs sent me by Mr. Hole were taken on the 5th November and 6th December 1893 and 6th November 1892. Mr. Hole informed me that a large number of the eggs were destroyed by the parent birds before they could be taken. As soon as the Mikir he employed began to ascend the tree the birds deliberately jabbed their beaks through the egg, in some cases going through both sides, but in the majority only smashing a large piece out of one. A large number of these eggs also were sent me and bore out the description given me by Mr. Hole.

(635) Pseudotantalus leucocephalus.—The Painted Stork.

Hume, No. 938 ; *Blanford, No.* 1552.

Occurs sparingly at odd times throughout Cachar, but is never any thing but very rare.

(636) Anastomus oscitans—The Open-bill.

Hume, No. 640 ; *Blanford, No.* 1553.

Very common, often occurring in really huge flocks. The greater number of the birds remove to Sylhet to breed, but great numbers still stay in Cachar. It occasionally builds a solitary nest and sometimes only two or three build in company.

Sub-Order—Ardeæ.

Family *Ardeidœ.*

(637) Ardea manillensis.—The Eastern Purple Heron.

Hume, No. 924 ; *Blanford, No.* 1554.

Very little seen, yet by no means rare. Breeds in the district, for though I have never taken nests or eggs I have had young nestlings brought to me.

(638) Ardea cinerea.—The Common Heron.

Hume, No. 923 ; *Blanford, No.* 1555.

Decidedly rare. This species is more often met with fishing in the higher streams than is *A. purpurea*; but is on the whole far less often seen than is that bird.

(639) Herodias alba.—The Large Egret.

Hume, No. 925 ; *Blanford, No.* 1559.

Scattered here and there throughout the district but only in very small numbers.

(640) H. intermedia.—The Lesser Egret.

Hume, No. 926 ; *Blanford, No.* 1560.

Even less common than the last.

(641) H. GARZETTA.—The Little Egret.

Hume, No. 927-927 *bis; Blanford, No.* 1561.

Very common.

(642) BUBULCUS CORAMANDUS.—The Cattle Egret.

Hume, No. 929 ; *Blanford, No.* 1562.

Still more common; ascends the hills occasionally up to 2,200 feet, above which I have not met with it.

(643) LEPTERODIUS SACER.—The Eastern Reef Heron.

Hume, No. 928 *bis* ; *Blanford, No.* 1564.

Must be a very rare bird in the Surma Valley. I have two specimens, neither quite adult, which were shot in the Chutta bheel, Cachar, but I can find no other record of their appearance in Assam, nor have any of my correspondents ever met with it.

(644) ARDEOLA GRAYI.—The Pond Heron.

Hume, No. 929 ; *Blanford, No.* 1565.

As common in Cachar as everywhere else; I do not know how Hume failed to notice it more often; it ascends the streams up to 3,000 feet.

(645) BUTOROIDES JAVANICA.—The Little Green Heron.

Hume, No. 931 ; *Blanford, No.* 1567.

Extremely common in the hills on all of the streams, but less so in the plains. Far from the hills it appears seldom to wander. It is a silent, solitary bird, seeking darkness and shade and venturing as little as possible into bright sunlight.

(646) NYCTICORAX GRISEUS.—The Night Heron.

Hume, No. 937 ; *Blanford, No.* 1568.

Rare in Cachar, but, of course, where it does occur it assembles in large flocks. I have heard its cry at elevations of over 3,000 feet but never saw the bird, and whether it lived at these heights or merely crossed the ridges working from one stream to another, I cannot say.

(647) GORSACHIUS MELANOLOPHUS.—The Malay Bittern.

Hume, No. 936 *bis* ; *Blanford, No.* 1569.

Recorded by Hume from North-Eastern Cachar. I have not met with it. Mr. Primrose has also obtained a specimen.

(648) Ardetta sinensis.—The Yellow Bittern.

Hume, No. 934 ; *Blanford, No.* 1571.

A rare bird and from its skulking habits but little noticed. I have put them up on the borders of streams at over 1,000 feet elevation, but they are more plains than hill birds.

(649) A. cinnamomea.—The Chestnut Bittern.

Hume, No. 933 ; *Blanford, No.* 1572.

Very common.

(650) Dupetor flavicollis.—The Black Bittern.

Hume, No. 932 ; *Blanford, No.* 1573.

Quite common but, I think, the most strictly crepuscular of all the small bitterns.

(651) Botaurus stellaris.—The Bittern.

Hume, No. 936 ; *Blanford, No.* 1574.

I have only once come across the Bittern in Cachar, but it was under very remarkable circumstances. Once when out shooting at a place called Bandho on the river Diyung, which there ran at about 750 feet elevation, I came on a nest in a tree which puzzled me greatly. It was high up, fully 50 feet from the ground, and was made mainly of branches and twigs, but on this was a kind of superstructure of weeds and leaves and one long strip of Cachari cloth. It contained two young birds which I kept, but before taking them I awaited the arrival of the old birds and shot the female which proved to be a Bittern. What it was doing building such a nest in such a place I cannot say, but there was no doubt as to the identity.

Order XIX—ANSERES.

For the sake of uniformity I adopt Blanford's classification in this article, but this does not mean that I think it better than Salvadori's, which, but for the reason mentioned, I should have made use of. As I am in the course of writing separately on Indian ducks, the notes here will be only such as have reference to matters newly ascertained.

Family Anatidæ.

Sub-Family *Anserinæ.*

(652) Anser ferus.—The Grey Lag Goose.

Hume, No. 945 ; *Blanford, No.* 1579.

No geese can be said to be common in Cachar, though in some years both this and *A. indicus* may be found in fair numbers.

(653) A. BRACHYRHYNCHUS.—The Pink-footed Goose.

Hume, No. 940 ; *Blanford, No.* 1582.

Extremely rare.

(654) A. INDICUS.—The Barred-headed Goose.

Hume, No. 949 ; *Blanford, No.* 1583.

The Barred-headed Goose seems to be more common in Cachar and Sylhet than I imagined when writing of that species in my article on Indian Ducks. Some years they are doubtless to be found in considerable numbers, though never in the countless flocks to be found in their favourite haunts.

Sub-Family ANATINÆ.

(655) SARCIDIORNIS MELANONOTUS.—The Comb Duck.

Hume, No. 950 ; *Blanford, No.* 1584.

(656) ASARCORNIS SCUTULATUS.—The White-winged Wood-Duck.

Hume, No. 955 ; *Blanford, No.* 1585.

There is, I think, little doubt that the Wood-Duck grows a comb during the breeding season, so that the main, almost the only reason for separating the two species, the Comb Duck and Wood-Duck, into separate genera is done away with. The late Mr. M. G. Peddie, a most keen and careful observer and a fair ornithologist, wrote to me saying that he had had several opportunities of observing the Wood-Duck in the north of N. Cachar. From inquiries made he ascertained that two or three pairs frequented a small stream which runs into the Diyung ; he accordingly visited the spot and soon came on a pair ; he had a shot at them with his collector's gun, but the tiny weapon was of no use on such powerful birds. He, however, *noticed most distinctly that the drake had a large comb*, and this he thought was not much inferior in size to that of the Comb Duck. He again twice saw a pair and each time saw the comb on the male quite plainly. Again, talking to Mr. Scott about the bird he had seen, he said that the most noticeable thing about the bird was a huge knob on the bill. He has again seen either this bird or the pair to it, but noticed no knob. As this latter time the bird was seen in November, the comb would have naturally disappeared again.

(657) Rhodonessa caryophyllacea.—The Pink-headed Duck.
Hume, No. 960; *Blanford, No.* 1586.

(658) Casarca rutila.—The Ruddy Sheldrake or Brahminy Duck.
Hume, No. 954; *Blanford, No.* 1588.

(659) Dendrocycna javanica.—The Whistling Teal.
Hume, No. 952; *Blanford, No.* 1589.

(660) D. fulva.—The Large Whistling Teal.
Hume, No. 953; *Blanford, No.* 1590.

(661) Nettopus coromandelianus.—The Cotton Teal.
Hume, No. 951; *Blanford, No.* 1591.

(662) Anas boscas.—The Mallard.
Hume, No. 958; *Blanford, No.* 1592.

(663) A. pœcilorhyncha.—The Spotted-billed Duck.
Hume, No. 959; *Blanford, No.* 1593.

(664) Chaulelasmus streperus.—The Gadwall.
Hume, No. 961; *Blanford, No.* 1595.

(665) Nettium crecca.—The Common Teal.
Hume, No. 964; *Blanford, No.* 1597.

(666) Mareca penelope.—The Wigeon.
Hume, No. 963; *Blanford, No.* 1599.

(667) Dafila acuta.—The Pintail.
Hume, No. 962; *Blanford, No.* 1600.

(668) Querquedula circia.—The Garganey or Blue-winged Teal.
Hume, No. 965; *Blanford, No.* 1601.

(669) Spatula clypeata.—The Shoveller.
Hume, No. 957; *Blanford, No.* 1602.

(670) Netta rufina.—The Red-crested Pochard.
Hume, No. 967; *Blanford, No.* 1604.

(671) Nyroca ferina.—The Pochard or Dun-bird.
Hume, No. 968; *Blanford, No.* 1605.

(672) N. ferruginea.—The White-eyed Duck.
Hume, No. 969; *Blanford, No.* 1606.

(673) N. baeri.—The Eastern White-eyed Duck.
Blanford, No. 1607.

(674) N. fuligula.—The Tufted Duck.

Hume, No. 971; *Blanford, No.* 1609.

Two birds, both males, were shot by Mr. R. S. Routh on a large tank in Haflong, on the 5th November. There is another young female from Cachar in my collection.

Order XX.—PYGOPODES.

Family Podicepedidæ.

(675) Podicipes albipennis.—The Dabchick.

Hume, No. 975; *Blanford, No.* 1617.

The Little Grebe or Dabchick is found in no great numbers throughout Cachar, and I have obtained them in a solitary pool on the crest of a ridge over 3,000 feet altitude.

LEPIDOPTERA TAKEN IN CUTCH.

By Capt. C. G. Nurse, F.R.G.S., F.E.S.

My stay in Cutch only extended from December 1891 to March 1893, and I cannot therefore hope that the following list contains nearly all the species of *Lepidoptera* which occur there. I do not think however that many more species of Butterflies will be added to my list, though as far as the Moths are concerned, an assiduous collector might probably in a few years almost double the number of species enumerated below. But the following list may be of interest in showing the chief species of *Lepidoptera* that occur in such a dry locality, and I hope that it may induce the next entomologist who may be stationed there to place on record the result of his labours. My collecting was done chiefly round Bhuj, the capital, and it is almost needless to remark that most of my specimens were obtained during and immediately after the rains.

With regard to nomenclature: I have, except where otherwise mentioned, followed Mr. De Nicéville so far as the three published volumes of the Butterflies of India go. In the *Pierinæ* I follow the late Capt. E. Y. Watson in his "Notes on the synonymy of some species of Indian *Pierinæ*" (J. Bo. Nat. Hist. Society, Vol. VIII, No. 4); also as regards the *Hesperidæ* I follow him in Hesperidæ Indicæ, as modified by his article in Vol. IX, No. 4 of this journal.

In the Moths I follow Sir G. F. Hampson in his Volumes on Moths in the Fauna of India series. I also desire to acknowledge his kindness in assisting me to identify my specimens at the British Museum. Whenever I was in doubt as to the identification of a specimen, he was good enough to put me right, and I therefore feel far more confidence in the accuracy of the following list than I should had it been the result of my own unaided efforts.

In thus following recognised authorities, I have not thought it necessary to quote in brackets after each species the name of the describer, which can easily be ascertained by reference to the above-quoted works.

RHOPALOCERA.

Danais limniace—Common during the rains.

Danais chrysippus—Abundant everywhere at all seasons.

Danais genutia—Not uncommon in the rains.

Euplœa core—One of the commonest butterflies in the rains.

Melanitis leda—I saw a specimen of this species on one occasion when I had no net.

Ergolis ariadne—One specimen at Charwah, about 12 miles from Bhuj.

Byblia illithyia—Very common at Charwah, and occasionally seen near Bhuj.

Junonia lemonias
Junonia hierta
Junonia orithyia
} All very common during the rains, but occasional specimens were to be seen all the year round.

Hypolimnas bolina
Hypolimnas misippus } Common during the rains.

Pyrameis cardui—Abundant, especially during October.

Chelades laius—I obtained several specimens among orange trees in H. H. the Rao's garden, but did not see it elsewhere.

Chilades putli—Swarms among low herbage during the rains. I follow Col. Yerbury (Jour. Bo. Natural Hist. Society, Vol. VII, p. 211, in keeping this species distinct from *C. trochilus.*

Zizera lysimon
Zizera gaika } Both these species were very common, but I did not come across *Z. maha* in Cutch, though it occurs commonly in most parts of Western India.

Azanus ubaldus.—A single specimen.

Azanus uranus.—Common among babul trees, on which the larva presumably feeds.

Catochrysops strabo.—A single specimen in February.

Catochrysops contracta.—Swarms all the year round. Mr. De Nicéville considers this only a form of *C. cnejus.* I have taken a large number of specimens of *C. contracta*, both in Cutch and at Aden, and they appear to me to be prefectly distinct from *C. cnejus.* The Aden females of *C. contracta*, however, differ from the Cutch females in having more blue on the upper side. *C. contracta*, which occurs in dry localities, is generally to be found near small thorn bushes, whereas *C. cnejus* is found chiefly in cultivation. I have taken both species at the same time of the year at Poona. I never took typical *C. cnejus* in Cutch.

Tarucus theophrastus.—Abundant all the year round.

Tarucus plinius.—Not uncommon during the rains.

Polyommatus bœticus.—Very common.

Aphnæus ictis.—Six specimens taken at Charwah appear from comparison with those in the British Museum to be of this species, but the species of this genus run into one another, and are very confusing.

Aphnæus hypargyrus.—Not uncommon at the beginning of the rains; a very quick flyer, and difficult to obtain in good condition.

Rapala melampus.—Rare.

Virachola isocrates.—Too common, but not often seen on the wing. I bred a fair number of this species from pomegranates. I think that more than half this fruit never comes to maturity in Cutch owing to the ravages of the larvæ of this insect.

Catopsilia pyranthe.—Very common.

Appias libythea.—Two specimens only.

Belenois mesentina.—Swarms round thorn bushes, on which the larva feeds. I have often seen over a dozen pupæ on one twig.

Terias hecabe.
Terias læta. } All very common.
Terias venata.

Teracolus faustus—Common during the hot weather and rains.

Teracolus amatus—Common nearly all the year.

Teracolus protractus—Fairly common at the beginning of the rains.

Teracolus vestalis—Three specimens only.

Teracolus puellaris.
Teracolus danæ. } All common.
Teracolus etrida.

Badamia exclamationis—A few during the rains.

Gegenes karsana—Not uncommon.

Suastus gremius—Two specimens.

Parata chromus—Common during the rains.

Chapra mathias—Abundant.

Sarangesa sati—This pretty little species was described by Mr. De Nicéville in Jour. Bo. Nat. Hist. Society, Vol. VIII, p. 391. I found it very common in Cutch during August, September, and October. Like other species of the genus it has the habit of settling on the ground with the wings spread out.

Pyrgus galba—Common.

HETEROCERA.

Acherontia styx—Common.

Chærocampa oldenlandiæ—A single specimen.

Chærocampa theylia—Two.

Chærocampa celerio—Common.

Deilephila livornica—Common.

Protoparce convolvuli—Common.

Macroglossa stellatarum—A single specimen.

Macroglossa belis—Not uncommon.

Macroglossa affictitia—Common.

Cephonodes hylas—Fairly common.

Chilena strigula—Two specimens.

Thiacidas postica—One.

Euproctis latifascia—One.

Euproctis varia—One.

Hypsa ficus—One.

Arctia ricini—One.

Creatonotus moorei—Common.

Creatonotus insolatus—One.

Deiopeia pulchella—Abundant.

Earias insulana—Two specimens.

Ægocera venulia—Very common.

Adisura atkinsoni—One,

Heliothis nubigera.
Heliothis hyalosticta. } Both fairly common.

Chariclea marginalis—One.

Euplexia conducta—One.

Amyna octo—Very common.

Caradrina exigua—One.

Tathorhynchus vinctale—Three.

Leucania loreyi—Three.

Leucania irregularis—One.

Tarache basifera—Common.

Tarache crocata—One.

Tarache flavonigra—Four.

Tarache catena—One.

Tarache nigritula—A new species described by Hampson from my specimens.

Xanthoptera opella—Two.

Xanthoptera nigripalpis—One.

Xanthoptera veprecola—Four.

Metachrostis itwarra—One.

Metachrostis venata—One.

Metachrostis badia—One.

Metachrostis albimarginata—A new species described by Hampson from my specimens.

HETEROCERA—*contd.*

Eublemma amabilis—One.
Hyblæa puera—Common.
Ingura subapicalis—Common.
Eutelis discistriga—Two.
Cosmophila sabulifera—One.
Cosmophila erosa—One.
Polydesma quenavadi—Common.
Polydesma vetusta—Two.
Melipotis heliothidia.
Lyncestis metaleuca.
} Both new species described by Hampson from my specimens.
Pseudophia indecisia—Common.
Ophiusa algira—One.
Ophiusa serva—Four.
Ophiusa tirrhaca—Two.
Plecoptera reflexa—Two.
Acantholipes circumdatus—Three.
Remigia archesia—One.
Trigonodes hyppasia—Common.
Trigonodes ino—One.
Grammodes stolida—Common.
Ophideres materna—Common.
Plusia limberena—Three.
Plusia erisoma—One.
Plusia ni—One.
Plusia lobifera—One.
Calesia satellitia—One.
Raparna digramma—Two.
Raparna imparata—Common.
Hypena abyssinialis—Common.
Macaria frugaliata—One.
Macaria fidoniata—One.
Orsonoba clelia—Three.
Tephrina disputaria—Common.
Tephrina catalaunaria—Common.
Tephrina perciaria—Two.
Boarmia acaciaria Three.
Sterrha sacraria—One.
Craspedia addictaria—Three.
Craspedia idearia—Common.
Craspedia fibulata—Two.
Craspedia actuaria—Common.
Craspedia jacta—Common.
Timandra mundissima—Three.
Nemoria solidaria—One.
Thallassodes obnupta—Two.
Surattha albipennis—Common.
Anerastia ablutella—One.
Ancylosis fuscosparsella—One.
Nephopteryx akbarella—Two.
Stenia spodinopa—One.
Zinckenia fascialis—Very common.
Bocchoris onychinalis—Two.
Lygropia obrinusalis—Common.
Pygospila tyres—Three.
Lepyrodes geometralis—Two.
Leucinodes orbonalis—One.
Crocidolomia binotalis—Two.
Sameodes cancellalis—One.
Phlyctænodes nudalis—Common.
Phlyctænodes brevifascialis—Three.
Antigastra catalaunalis—One.
Noorda blitealis—One.
Tegostoma comparella—Common.
Polyocha cinerella—One.

THE FLORA OF WESTERN INDIA.

By G. Marshall Woodrow, Professor of Botany,
College of Science, Poona.

Part VII.

(*Continued from page 373 of this volume.*)

CXXXVI.—Urticaceæ.

2. *Holoptelea.*

H. integrifolia, *Planch.*, F.B.I.—V-481. *Wawali, Papada, Keul.* Poona. Feb.-Mar.

3. *Celtis.*

C. Wightii, *Planch.* Khandala.

4. *Trema.*

T. orientalis, *Bl.*, F.B.I.—V-484. *Goli, Khargoli.* Khandala. Mar.-Apr.
T. politoria, *Planch.*, F.B.I.—V-484. *Gadar.* Pal jungles. Feb.

6. *Cannabis.*

C. sativa, *Linn.*, F.B.I.—V-487. *Ganje-acha-jhad.* Poona, Cult. Nov.-Dec.

10. *Streblus.*

S. asper, *Lour.*, F.B.I.—V-489. *Karera, Khasota, Khasoli,* Dharwar. Guzerat. Feb -Mar.

14. *Morus.*

M. alba, *Linn.*, F.B.I.—V-492. *Toot.* Poona. Planted. Dec.
M. indica, *Linn.*, F.B.I.—V-492. Poona, Dharwar. Planted. Dec.

17. *Ficus.*

F. gibbosa, *Bl.*, F.B.I.—V-497. *Datira, Dantira.* Peint. W. Ghats. Nov.-Mar.
F. bengalensis, *Linn.*, F.B.I.—V-499. *Wad.* Banyan, Widely. All the year.
F. mysorensis, *Heyne*, F.B.I.—V-500. *Burali Wad.* Peint. Dharwar. Nov.-Jan.
F. elastica, *Roxb.*, F.B.I.—V-508. *India-rubber Tree.* Poona, Bombay, Gardens.
F. retusa, *Linn.*, F.B.I.—V-511. Kadgal, N. Kanara.
F. Talboti, *King.*, F.B.I.—V-512. N. Kanara.
F. nervosa, *Roth*, F.B.I.—V-512. Lanauli. Apl.
F. Rumphii, *Bl.*, F.B.I.—V-572. *Ashta. Pyer. Kurak-pyar.* W. Ghats.
F. religiosa, *Linn.*, F.B.I.—V-513. *Pepal.* Widely.
F. Arnottiana, *Miq.*, F.B.I.—V-513. W. Ghats.
F. Tjakela, *Burm.*, F.B.I.—V-514. Sirsi, N. Kanara.
F. Tseila, *Roxb.*, F.B.I.—V-515. Planted widely.
F. infectoria, *Roxb.*, F.B.I.—V-515. *Pyer* (Peint.) Planted widely.
F. callosa, *Willd*, F.B.I.—V-516. N. Kanara.
F. heterophylla, *Linn.*, F.B.I.—V-518. Poona.
F. asperrima, *Roxb.*, F.B.I.—V-522. *Kurwat* N. Kanara.
F. hispida, *Linn.*, F.B.I.—V-522. *Gavotri, Kal-Umbar, Ghandya, Umbar.* Konkan.

F. scandens, *Roxb.*, F.B.I.—V-526. Gardens.
F. palmata, *Forsk.*, F.B.I.—V-530. Dhulia. Dinduri.
F. glomerata, *Roxb.*, F.B.I.—V-535. *Umbar, Gular.* Widely. Nov.-Feb.
F. carica, *Linn.* *Angir, Fig.* Gardens.

18. *Antiaris.*

A. toxicaria, *Leschen*, F.B.I.—V-537. *Jasund, Chandul. The Upas Tree.* W. Ghats. Konkan.

20. *Artocarpus.*

A. hirsuta, *Lamk.*, F.B.I.—V-541. *Anjali, Ayani.* Divimana N. Kanara.
A. integrifolia, *Linn.*, F.B.I.—V-541. *Phunnus.* W. Ghats. Planted widely.
A. Lakoocha, *Roxb.*, F.B.I.—V-543. *Onda, Bundal.* Dharwar, Planted. March.
A. incisa, *Linn., Roxb.*, F.I III.., 527. Gardens, Poona. Bombay. Honawer.

22. *Conocephalus.*

C. sauveolens, *Bl.*, F.B.I.—V-545. Gardens. Nov.-Dec.
C. sp. Yacombi, N. Kanara. Feb.

26. *Fluerya.*

F. interrupta, *Gaud.*, F.B.I.—V-548. *Khajakuli.* W. Ghats. Aug.

Laportea.

L. Schomburghii. Nich. Dist. Gard. II. 235. Gardens.
L. crenulata, *Gaud.*, F.B.I.—V-550. Konkan *Stocks.*

28. *Girardinia.*

G. heterophylla, *Dcne.*, F.B.I.—V-550. *Motha Khajati.* W. Ghats. Oct.

29. *Pilea.*

P. muscosa, *Lindl.* *Gunpowder Plant.* Poona, Bombay Gardens. Oct.

30. *Lecanthus.*

L. Wightii, *Wedd.*, F.B.I.—V-559. Matheran. Sept.-Oct.

32. *Elatostema.*

E. lineolatum, *Wight*, F.B.I.—V-565. Castle Rock.
E. cuneatum, *Wight.* F.B.I.—V-568 W. Ghats. Sept.-Oct.

34. *Boehmeria.*

B. malabarica, *Wedd.*, F.B.I.—V-575. Karwar. Jan.
B. nivea. *Hook. and Arn.*, F.B.I.—V-576. *Rhea.* Gardens. Nov.-Jan.
B. platyphylla, *Dcne.*, F.B.I.—V-578. Pen. Konkan. Oct.

36. *Pouzolzia.*

P. indica, *Gaud.*, F.B.I.—V-581. Hills, near Junir. Sept.
P. pentandra, *Benn.*, F.B.I.—V-583. Var. integrifolia, 23 Miles. W. of Kolhapur. Jan.
P. Bennettiana, *Wight.*, F.B.I.—V-585. Badami. Oct.
P. Wightii, *Benn.*, F.B.I.—V-584. Santawari. Sept.

41. *Debregeasia.*

D. velutina, *Gaud.*, F.B.I.—V-590. Ambeghat. Jan.

43. *Parietaria.*

P. debilis. *Forst.*, F.B.I.—V-593. Konkan.

44. *Forskohlea.*

F. tenacissima, *Linn.*, F.B.I.—V-953. *Khorsan.* Shahadpur, Sind. Feb.

CXXXIX.—CASUARINEÆ.

1. *Casuarina.*

C. equisitifolia, *Forst.* D.C. Prod. XVI. 338. *Kasurni.* Planted widely.

CXLI.—SALICINEÆ.

1. *Salix.*

S. tetrasperma, *Roxb.*, F.B.I.—V-626. *Wallung.* Poona. M.war. Sep.-Oct.

2. *Populus.*

P. euphratica, *Oliv.*, F.B.I.—V-638. Sind.

CLXII.—CERATOPHYLLEÆ.

C. demersum, *Linn.*, F.B.I.—V-639. Poona. Apr.

CXLIII.—GNETACEÆ.

1. *Ephedra.*

E. peduncularis, *Boiss.*, F.B.I.—V-641. Sind.

2. *Gnetum.*

G. scandens, *Roxb.*, F.B.I.—V-642. *Kombal.* Lanauli. Dec.

CXLIV.—CONIFERÆ.

1. *Cupressus.*

C. torulosa, *Don*, F.B.I.—V-645. Gardens.
C. glauca, *Lamk.* D.C. Proc. XVI.—470. *Siroo.* Gardens.
C. sempervirens, *Linn.*, F.B.I.—V-645. Gardens.
C. funibris, *Endl.* D.C. Prod XVI—471. Gardens.

2. *Juniperus.*

J. communis, *Linn.*, F.B.I.—V-646. Gardens.
J. chinensis. *Linn.*, D.C. Prod. XVI.—487. Gardens.

CXLV.—CYCADACEÆ.

1. *Cycas.*

C. circinalis, *Linn.*, F.B.I.—V-656. Gardens.
C. revoluta, *Thun.*, D.C. Prod. XVI—527. Gardens.

MONOCOTYLEDONS.

CXLVI—HYDROCHARIDEÆ.

1. *Hydrilla.*

H. verticillata, *Casp.*, F.B.I.—V-659. Poona. Dec.

2. *Lagarosiphon.*

L. Roxburghii, *Benth.*, F.B.I.—V-659. Lanauli. Aug.-Feb.

3. *Vallisneria.*

V. spiralis, *Linn.*, F.B.I.—V-660. *Saivala.* Poona. Apr.-May.

4. *Blyxa.*

B. Roxburghii, *Rich.*, F.B.I.—V-660. Lanauli. Feb.
B. echinosperma, *Hook. f.* F.B.I.—V-661. Mahableshwar.
B. Talboti, *Hook. f.* L.B.I.—V-662. N. Kanara, *Talbot.*

6. *Ottelia.*

O. alismoides, *Pers.*, F.B.I.—V-662. Poona. Apr.

CXLVII.—Burmanniaceæ.

1. *Burmannia.*

B. cœlestis, *Don.*, F.B.I.—V-665. Mahableshwar. Sep.
B. pusilla, *Thw.*, F.B.I.—V-665. Supa, N. Kanara.

CXLVIII.—Orchideæ.

1. *Oberonia.*

O. Falconeri, *Hook.*, F.B.I.—V-678. Konkan, Bombay, *Law.*
O. recurva, *Lindl.*, F.B.I.—V-680. Mahableshwar. Feb.-Apr.

2. *Microstylis.*

M. Rheedii, *Wight*, F.B.I.—V-690. Mahableshwar. July

3. *Liparis.*

L. Dalzellii, *Hook. f.* F.B.I.—V-698. S. Konkan, *Dalz.*

8. *Dendrobium.*

D. Macraei, *Lindl.*, F.B.I.—V-714. *Joivanwi.* Sumpkund, N. Kanara. July.-Mar.
D. microbulbon, *A. Rich.*, F.B.I.—V-716. Lanauli. Dec.
D. chlorops, *Lindl.*, F.B.I.—V-719. Konkan Ghats.
D. barbatulum, *Lindl.*, F.B.I.—V-719. *Jadhia Lusan.* Matheran. May.
D. herbaceum, *Lindl.*, F.B.I.—V-719. Mahableshwar.
D. Pierardi, *Roxb.*, F.B.I.—V-720. Gardens.

9. *Bulbophyllum.*

B. nilgherrense, *Wight.*, F.B.I.—V-761. Sumpkund, N. Kanara. Dec.

11. *Cirrhopetalum.*

C. fimbriatum, *Lindl.*, F.B.I.—V-774. Koina Valley. April.

12. *Trias.*

T. Stocksii, *Benth.*, F.B.I.—V-781. Kanara, N. and S. Konkan. *Law, Stocks.*

19. *Eria.*

E. reticulata, *Benth.*, F.B.I.—V-787. Chandway, Kanara. *Ritchie.*
E. Lichenora, *Lindl.*, F.B.I.—V-787. Sampkund. July.
E. reticosa, *Wgt.*, F.B.I.—V-787. Konkan.
E. Dalzellii, *Lindl.*, F.B.I.—V-789. Mahableshwar. May.
E. mysorensis, *Lindl.*, F.B.I.—V-793. Koina Valley. July.

24. *Phajus.*

P. Wallichii, *Lindl.*, F.B.I.—V-816. Gardens. Sept.-Jan.
P. albus, *Lindl.*, F.B.I.—V-818. Lanauli. Aug.

28. *Josephia.*

J. lanceolata, *Wgt.*, F.B.I.—V-823. Konkan. Ghats, *Stocks.*

36. *Pholidota.*

P. imbricata, *Lindl.*, F.B.I.—V-845. N. Kanara. July.

39. *Eulophia.*

E. herbacea, *Lindl.*, F.B.I.—VI-2. Dohad. Panch Mahals. July.
E. pratensis, *Lindl.*, F.B.I.—VI-4. *Satawari* Poona. Dec.-Jan
E. nuda, *Lindl.*, F.B.I.—VI-5. *Amberkund.* Londa. June.

40. *Cymbidium.*

C. bicolor, *Lindl.*, F.B.I.—VI-11. *Amberkund.* Sirsi, N. Kanara. May.

42. *Geodorum.*

G. purpureum, *Br.*, F.B.I.—VI-16. Warree. *Dalz.*

49. *Luisia.*

L. teretifolia, *Gaud.*, F.B.I.—VI-22. W. Ghats.
L. tenuifolia, *Bl.*, F.B.I.—VI-24. Bomenhali, N. Kanara. Aug.

50. *Cottonia.*

C. macrostachya, *Wgt.*, F.B.I.—VI-26. N. Kanara. May

55. *Rhynchostylis.*

R. retusa, *Bl.*. F.B.I.—VI-32. Kalyan. May.

58. *Ærides.*

Æ. maculosum, *Lindl.*, F.B.I.—VI-45. Mahableshwar. May.
Æ. crispum, *Lindl.*, F.B.I.—VI-45. Mahableshwar. May.
Æ. radicosum, *A. Rich.*, F.B.I.—VI-46. Mahableshwar. May.
Æ. odoratum, *Lour.*, F.B.I.—VI-47. Konkan. June.

60. *Vanda.*

V. parviflora, *Lindl.*, F.B.I.—VI-50. Mawal, Konkan. May.
V. Roxburghii, *Br.*, F.B.I.—VI-50. Konkan, Guzerat. July.

61. *Saccolabium.*

S. maculatum, *Hook, f.*, F.B.I.—VI-64. 6 mil. W. Divimana. May.

70. *Diplocentrum.*

D. sp. inc. Sirsi-Kumpta Road, N. Kanara. June

87. *Spiranthes.*

S. australis, *Lindl.*, F.B.I.—VI-102. Not found.

90. *Cheirostylis.*

C. flabellata, *Wgt.*, F.B.I.—VI-105. Kumta-Sirsi, Rd. Mar.

91. *Zeuxine.*

Z. sulcata, *Lindl.*, F.B.I.—VI-106. Deccan. Jan.

98. *Pogonia.*

P. plicata, *Lindl.*, F.B.I.—VI-119 Lanauli. May-June.
P. flabelliformis, *Lindl.*, F.B.I.—V-121. Lanauli. May-June.

106. *Habenaria.*

H. stenopetala, *Lindl.*, F.B.I.—VI-134. Konkan, *Stocks*
H. digitata, *Lindl.*, F.B.I.—VI-134. Lanauli, Khandala. July.
H. Gibsoni, *Hook. f.* F.B.I.—VI-135. W. Ghats. July.
H. grandiflora, *Hook. f.* F.B.I.—VI-136. Sinvaghad. Poorundhur. July.
H. rariflora, *A. Rich.*, F.B.I.—VI-136. Poorundhur. Kharkhalla. July-Aug.
H. Sussannæ, *Br.*, F.B.I.—VI-136. *Wagchora.* Khandala. Sept.

H. platyphylla, *Spreng.*, F.B.I.—VI-140. Belgaum, Dharwar. *Law.*
H. sauveolens, *Dalz.*, F.B.I.—VI-140. Vingurla, Malwan. *Dalz.*
H. longicalcarata, *A. Rich.*, F.B.I.—VI-141. Deccan. Sept.-Oct.
H. crinifera, *Lindl.*, F.B.I.—VI-142. Vingurla. *Dalz.*
H. commelinifolia, *Wall.*, F.B.I.—VI-143. Khandala. Sept.
H. Heyneana, *Lindl.*, F.B.I.—VI-148. Lanauli. Sept.
H. subpubens, *A. Rich.*, F.B.I.—VI-148. S. Konkan. *Dalzell.*
H. affinis, *Wgt.*, F.B.I.—VI-149. Konkan and Kanara. *Law.*
H. marginata, *Coleb.*, F.B.I.—VI-150. Poorundhur. Aug.
H. flavescens, *Hook. f*, F.B.I.—VI-150. Konkan. *Law.*
H. viridiflora, *Br.*, F.B.I.—VI-150. Malwan. *Dalz.*
H. crassifolia, *A. Rich.*, F.B.I.—VI-151. M. war, Poorundhur. Sept.
H. diphylla, *Dalz.*, F.B.I.—VI-151. S. Konkan, *Dalzell.*
H. Stocksii, *Hook. f*, F.B.I.—VI-158. Konkan. *Stocks. Ritchie.*
H. torta, *Hook. f*, F.B.I.—VI-159. W. Ghat, Southward.
H. goodyeroides, *Don.*, F.B.I.—VI-161. S. Konkan, *Dalzell.*
H. Wightii, *Trimen.*, F.B.I.—VI-162. Malwan, *Dalzell.*
H. Lawii, *Hook. f*, F.B.I.—VI-162. Konkan, *Law.*

Bletia. Tropical America.

B. verecunda, B. M. 930. Gardens. Jan.

CXLIX.—Scitaminbæ.

2. *Globba.*

G. marantina, *Linn.*, F.B.I.—VI-206. Yelapur, N. Kanara. Aug.

6. *Curcuma.*

C. neilgherrensis, *Wgt.*, F.B.I.—IV-210. Shinvagadh.
C. Ranadei, *Prain*, Jour. Bombay Nat. His. Soc. Lanauli.
C. aromatica, *Salisb.*, F.B.I.—VI-210. *Ambe Halad.* Konkan. May.
C. Zedoaria, *Rosc*, F.B.I.—VI-210. *Kachora.* Cult.
C. Amada, *Roxb.*, F.B.I.—VI-213. Konkan and Guzerat. *Nimmo.*
C. longa, *Linn.*, F.B.I.—VI-214. *Halad.* Cult.
C. montana, *Rosc.*, F.B.I.—VI-214. Konkan. *Dalzell.*
C. decipiens, *Dalz.*, F.B.I.—VI-215. Konkan, *Dalzell.*

8. *Kæmpferia.*

K. Galanga, *Linn.*, F.B.I.—VI-219. *Chandamula.* Mawal. June-July.
K. pandurata, *Roxb.*, F.B.I.—VI-220. S. Konkan, *Nimmo.*
K. rotunda, *Linn.*, F.B.I.—VI-222. *Bhuichampa.* Gardens. Apl.
K. scaposa, *Benth.*, F.B.I.—VI-224. *Choholœ.* Lanauli. Aug.-Dec.

9. *Hitchenia.*

H. caulina, *Baker*, F.B.I.—IV-224. *Châvara.* Panchgani. Sept.

10. *Hedychium.*

H. coronarium, *Kœnig*, F.B.I.—VI-225. *Sontaka.* Lanauli. Aug.-Sept.

11. *Amomum.*

A. microstephanum, *Baker*, F.B.I.—VI-239. Konkan, *Stocks.*

12. *Zingiber.*

Z. Nimmonii, *Dalz.*, F.B.I.—VI-244. Konkan, *Dalz.*
Z. cerneum, *Dalz.*, F.B.I.—VI-245. Ram Ghat, *Dalz.*
Z. officinale, *Roxb.*, F.B.I.—VI-246. *Sunt. Alai.* Cult.
Z. Zerumbet, *Sm.*, F.B.I.—VI-247. S. Konkan, *Dalz.*
Z. macrostachyum, *Dalz.*, F.B.I.—VI-247. Konkan, *Graham.*
Z. Casumunar, *Roxb.*, F.B.I.—VI-248. *Malbari Halad.* Londa, W. Ghat. July.

13. *Costus.*

C. speciosus, *Sm.*, F.B.I.—VI-249. *Kosht, Khambari.* Castle Rock. W. Ghats. Oct.

15. *Elettaria.*

E. Cardamomum, *Mat.*, F.B.I.—VI-251. *Waelchi* Cardamum. Gardens. Jan.

18. *Alpinia.*

A. Galanga, *Sw.*, F.B.I.—VI-253. Warree Country. May.
A. Allughas, *Rox.*, F.B.I.—VI-253. Konkan, *Graham.*
A. nutans, *Rox.*, F.B.I.—VI-254. Gardens.

21. *Phrynium.*

P. spicatum, *Roxb.*, F.B.I.—VI-259. Konkan, *Law.*

22. *Canna.*

C. indica, *Linn.*, F.B.I.—VI-260. *Kurdali.* Gardens.

Heliconia.

H. buccinata, *Roxb.*, F.I., Cl. Ed., 225. Gardens.

23. *Musa.*

M. superba, *Roxb.*, F.B.I.—VI-261. *Chowani. Cowdar.* W. Ghats, widely.
M ensete, Bot. Mag. *t.* 5223. Gardens.
M. sapientum, *Linn.*, F.B.I.—VI-262. Gardens.

Sub-species and varieties of M. Sapientum.

M. Dacca, *Horan.* *Mhaisi. Kale.* Gardens.
M. Champa, Hort. *Sonkale.* Gardens.
M. paradisiaca, *Linn.* Gardens.
M. textilis, *Née.* *Manilla Hemp.* Gardens.
M. zebrina. *Striped-leaved.* Gardens.
M. vittata. Gardens.
M. Cavendishii.
M. sumatrana, Illus. Hort.—375.

BROMELIACEÆ.

Ananasa sativa. *Ananas, Pine Apple.* Cult. Jan.-Mar.

CL.—HÆMODORACEÆ.

2. *Peliosanthes.*

P. neilgherriensis. *Wgt.*, F.B.I.—VI-266. Kanara *hight.*

3. *Ophiopogon.*

O. intermedius, *Don.*, F.B.I.—VI-269, Mahableshwar. Sept,

4. *Sansevieria.*

S. Zeylanica, *Willd.*, F.B.I.—VI-271. *Moorva. Naghin.* Bow String Hemp. Gardens. Jan.
S. cylindrica, Bojer, Bot. Mag. 5093. Gardens.

CLI.—IRIDEÆ.

Belamcauda.

B. chinensis, *Leman.*, F.B.I.—VI-276. Gardens.

CLII.—AMARYLLIDEÆ.

1. *Hypoxis.*

H. aurea, *Lour.* F.B.I.—VI-277. Khandala.

2. *Curculigo.*

C. recurvata, *Dryand.*, F.B.I.—VI-278. Gardens.
C. orchioides, *Gaertn.*, F.B.I.—VI-279.

3. *Crinum.*

C. asiaticum, *Linn.*, F.B.I.—VI- 280. *Nagdaun.* Gardens.
C. ensifolium, *Roxb.*, F.B.I.—VI-281. *Sampkanda.* Poona. Oct.-Dec.
C. latifolium, *Linn.*, F.B.I.—VI-283. *Dakh.* Lanauli. Panchgani. May-June.
C. brachynema, *Herb.*, F.B.I.—VI-284. *Mahalla.* Mahableshwar. May-June.
C. Woodrowii *Baker*, Bot. Mag. Mahableshwar. May-June.

4. *Pancratium.*

P. triflorum, *Roxb.*, F.B.I.—VI-285. Mahableshwar, Poona. May-June.
P. parvum, *Dalz.*, F.B.I.—VI-286. Purandhar. July.

Agave, Central and South America.

A. americana, *Linn.*, *Latia Guial.* Planted.
A. ,, variegata.
A. vivipara, *Linn.*, *Wgt.*, *Icon*, 2024. *Guial, Kaikal.* Planted. Jan.-June.
A. ,, short leaved form. *Chota Guial.* Planted. Jan.-June.
A. ,, ,, variegated. Gardens.
A. ,, ,, Cookei. Gardens.
A. rigida sisaliana. Sisal Hemp. Planted. Jan.-Ma.

Furcræa, Trop. America.

F. gigantea, *Vent.*, *Wgt.*, *Icon*, 2025. *Natal Hemp.* Planted.

CLIII.—TACCACEÆ.

1. *Tacca.*

T. pinnatifida, *Forst.*, F.B.I.—VI-287. *Deva-kanda. Towkirachajhad.* Kalyan. Sept.
T. lævis, *Roxb.*, F.B.I.—VI-288. S. Konkan, *Nimmo.*

CLIV.—DIOSCOREACEÆ.

Dioscorea.

D. dæmona, *Roxb.*, F.B.I.—VI-289. Castle Rock. Oct.
D. pentaphylla, *Linn.*, F.B.I.—VI-289. *Shendwail.* Shinvagadh. Sept.
D. Jacquemontii, *Hook. f.*, F.B.I.—VI-290. Between Poona & Karli. *Jacq.*
D. spinosa, *Roxb.*, F.B.I.—VI-291. Gardens.

D. oppositifolia, *Linn.*, F.B.I.—VI-292. *Paspoli.* Gardens.
D. glabra, *Roxb.*, F.B.I.—VI-294. Konkan.
D. sativa, *Linn.*, F.B.I.—VI-295. *Gorkan.* Poona. Aug.
D. alata, *Linn.*, F.B.I.—VI-296. *Goradu.* Cult. Poona. Aug.

CLVI.—LILIACEÆ.

1. *Smilax.*

S. macrophylla, *Roxb.*, F.B.I.—VI-310. *Ghotwail.* Mahableshwar. Aug.

3. *Asparagus.*

A. dumosus, *Baker*, F.B.I.—VI-315. Karachi. *Stocks.*
A. Jacquemontii, *Baker*, F.B.I.—VI-316. Between Poona & Karli. *Jacq.*
A. racemosus, *Willd.*, F.B.I.—VI-316. *Satavari.* Castle Rock. Poona. June-Sept.
A. lævissimus, *Steud.*, F.B.I.—VI-317. Western Ghats.
A. gonoclados, *Baker*, F.B.I.—VI-318. Siddapur, N. Kanara. Jany.

Alœ, S. Africa.

A. vera. *Yellia.* Planted.
A. variegata. *Chatia Yellia.* Gardens.

Yucca, N. and Cent. America.

Y. gloriosa—Bot. Mag. 1260, *Yucca.* Gardens.
Y. alœfolia—Bot. Magt. 1700. Gardens.

11. *Dracaena.*

D. terniflora, *Roxb.*, F.B.L.—VI-328.

12. *Cordyline.*

C. terminalis, *Kunth.* F.B.I.—VI-331.

13. *Asphodelus.*

A. tenuifolius, *Cavan.*, F.B.I.—VI-332. *Paiji.* Kirkee. Guzerat. Feb.

15. *Chlorophytum.*

C. Heyneanum, *Wall.*, F.B.I.—VI-333.
C. glaucum, *Dalz.*, F.B.I.—VI-334.
C. tuberosum, *Baker*, F.B.I.—VI-334.
C. attenuatum, *Baker*, F.B.I.—VI-335.
C. malabaricum, *Baker.*, F.B.I.—VI-835. Kulai. Poona June-July.
C. orchidastrum, *Lindl.*, F.B.I.—VI-336.
C. laxum, *Br.*, F.B.I.—VI-336.

16. *Dianella.*

D. ensifolia, *Bed.*, F.B.I.—VI-337. Gardens.

Agapanthus, S. Africa.

A. umbellatus, African Lily. Gardens. May.

17. *Allium.*

A. ascalonicum, *Linn.*, F.B.I.—VI-337. The Shallot. Gardens.
A. ampeloporasum, *Linn.* The Leek. Gardens.
A. cepa, *Linn.*, F.B.I.—VI-337. *Paiz.* The Onion. Gardens.
A. sativum, *Luzan.* The Garlic. Gardens.

18. *Dipcadi.*

D. montanum, *Baker*, F.B.I.—VI-346. Junir. July.

D. minor, *Hook. f.*, F.B.I.—VI-346. Malwan, *Dalzell.*

D. concanense, *Dalz.*, F.B.I.—VI-346. Hewra, *Dalzell*

D. unicolor, *Baker*, F.B.I.—VI-347. Sind, *Stocks.*

19. *Urginea.*

U. indica, *Kunth.*, F.B.I.—VI-347. *Junali Paiz. Kolkanda.*

20. *Scilla.*

S. indica, *Baker*, F.B.I.—VI-348. *Paharikanda.* Alundi. July.

28. *Iphigenia.*

I. indica, *Kunth.*, F.B.I.—VI-357. Poona. June.

I. pallida, *Baker*, F.B.I.—357. M. war. Belgaum. *Ritchie.*

30. *Gloriosa.*

G. superba, *Linn.*, F.B.I.—VI-358. *Kalalavi.* Poona. July-Aug.

32. *Disporum.*

D. Leschenaultianum, *Don*, F.B.I.—VI-360. Santaveri. *Talbot.*

Polianthes.

P. tuberosa. *Gulchabu.* Gardens.

CLVII.—PONTEDERIACEÆ.

Monochoria.

M. hastæfolia, *Presl.*, F.B.I.—VI-362. Sholapur. Dec.

M. vaginalis, *Presl.*, F.B.I.—VI-363. Malwan. Dec.

CLIX.—XYRIDEÆ.

1. *Xyris.*

X. indica, *Linn.*, F.B.I.—VI-364. Londa. Dec.

CLX.—COMMELINACEÆ.

2. *Commelina.*

C. nudiflora, *Linn.*, F.B.I.—VI-369. Poona. Kohlapur. Dec.

C. subulata, *Roth.*, F.B.I—VI-369.

C. salicifolia, *Roxb.*, F.B.I.—VI-370. Konkan.

C. Hasskarlii, *Clarke*, F.B.I.—VI-370. Poona. Aug.-Dec.

C. benghalensis, *Linn.*, F.B.I.—VI-370. *Kena.* Poona. Baroda. Aug.-Dec.

C. hirsuta, *Clarke*, F.B.I.—VI-371. Belgaum. *Ritchie.*

C. Forskalæi, *Vahl.*, F.B.I.—VI-371. Poona. Nov.

C. clavata, *Clarke.*, F.B.I.—VI-371. Matheran. Nov.

C. attenuata, *Koen*, F.B.I.—VI-372. Badami. Oct.

C. obliqua, *Ham.*, F.B.I.—VI-372. Purandhur. Aug.

C. paleata, *Hassk.*, F.B.I.—VI-372. Konkan. *Law.*

C. albescens, *Hassk.*, F.B.I.—VI-373. Sind. Oct.

3. *Aneilema.*

A. scapiflorum, *Wgt.*, F.B.I.—VI-375. S. Konkan.

A. lineolatum, *Kunth.*, F.B.I.—VI-376.

A. dimorphum, *Dalz.*, F.B.I.—VI-377. Konkan. *Dalzell.*

A. spiratum, *Br.*, F.B.I.—VI-377. Mwar. Rutnagiri. Oct.
A. pauciflorum, *Wgt.*, F.B.I.—VI-378. Mwar. Matheran. Oct.
A. versicolor, *Dalz.*, F.B.I.—VI-378. Konkan, *Dalzell.*
A. nudiflorum, *Br.*, F.B.I.—VI-378. Godra, Domus. Sept.
A. sinicum, *Lindl.*, F.B.I.—VI-379. Mahableshwar. Wada. Oct.
A. ochraceum, *Dalz.*, F.B.I.—VI-380. S. Konkan.
A. lanuginosum, *Wall.*, F.B.I.—VI-380. Mahableshwar. Sept.
A. Koenigii, *Wall.*, F.B.I.—VI-381.
A. paniculatum, *Wall.*, F.B.I.—VI-381. Mawal, Karwar. Aug.
A. vaginatum, *Br.*, F.B.I.—V-381. Matheran. Aug.

5. *Cyanotis.*

C. papilionacea, *Schultes*, F.B.I.—VI-384. Konkan.
C. cristata, *Schultes*, F.B.I.—VI-385. Wassand, Belgaum. Oct.
C. tuberosa, *Schultes*, F.B.I.—VI-386. Purandhur, Dharwar. Aug.
C. Wightii, *Clarke*, F.B.I.—VI-386. Panchgany, M. war. Aug.
C. fasciculata, *Schultes*, F.B.I.—VI-387. Deccan. N. Kanara. Aug.
C. vivipara, *Dalz.*, F.B.I.—VI-388. Syhahri. Hills. *Dalzell.*
C. axillaris, *Boem. and Sch.*, F.B.I.—VI-388. Poona, Baroda. Aug.-Sept.

7. *Floscopa.*

F. scandeus, *Lour.* F.B.I.—VI-393. Castle Rock. N. Kanara. Oct.-Nov.

CLXI.—Flagellarieæ.

1. *Flagellaria.*

F. indica, *Linn.*, F.B.I.—VI-391. S. Konkan. *Dalzell.*

CLXII.—Juncaceæ.

1. *Juncus.*

J. maritimus, *Lamk.*, F.B.I.—VI-393. Sind. April.
J. punctorius, *Linn.*, F.B.I.—VI-395. Sind. *Stocks.*

CLXIII.—Palmeæ.

1. *Areca.*

A. Catechu, *Linn.*, F.B.I.—VI-405. Cult. Gardens.

Actinorhytis.

A. capparia, *Wendl. et Drude Linnæa*—XXXIX-184. *Ram Supari.* Cult.

10. *Wallichia.*

W. caryotoides, *Roxb.*, F.B.I.—VI-419. Gardens.

12. *Arenga.*

A. Wightii, *Griff.*, F.B.I.—VI-422. Divimana, N. Kanara.

13. *Caryota.*

C. urens, *Linn.*, F.B.I.—VI-422. *Mhár. Birly mhár. Baini.*

16. *Phœnix.*

P. sylvestris, *Roxb.*, F.B.I.—VI-425. *Shindi.* Planted.
P. rupicola, *T. Anders.*, F.B.I.—VI-425. Gardens. Feb.
P. acaulis, *Buch.*, F.B.I.—VI-426.

P. humilis, *Royle.*, F.B.I.—VI-426. *var.* peduncalata. N. Kanara Ghats.
P. robusta, *Hook. f.*, F.B.I.—VI-427. *Shaelu.* Nandgaon, W. Ghats. Feb.

17. *Corypha.*

C. umbraculifera, *Linn.*, F.B.I.—VI-428. Planted.

18. *Nannorhops.*

N. Ritchieana, *H. Wend.*, F.B.I.—VI-429. *Pharra.* Sind. Aug.-Nov.

20. *Livistona.*

Hyphœne, N. Africa.

H. thebiaca. The Doum Palm. Planted. Nowsari. Bombay.
L. chinensis, *Br.*, F.B.I.—VI-434. Gardens.

21. *Calamus.*

Mr. Talbot, who has had special facilities for the study of this genus, says C. Thwaitesii Becc. and C. pseudotenuis Becc. and probably several other species occur in N. Kanara, but they are specially difficult to collect and determine.

THE FERNS OF NORTH-WESTERN INDIA,

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR: arranged and named on the basis of Hooker and Baker's *Synopsis Filicum*, and other works, with New Species added.

BY C. W. HOPE.

(*Continued from page* 325.)

PART II.

NEW SPECIES.*

Genus 8—DAVALLIA, *Smith.*

Subgenus—LEUCOSTEGIA, *Presl.*

5. **Davallia Beddomei,** n. sp.—*Rhiz.* creeping on trees, hard, woody, branching, densely clothed with light-brown, large, broadly lanceolate-acuminate scales, peltately attached near the free base, thickly overlapping each other, not adpressed, persistent; *st.* articulated on rhizome, and clothed like it for a short way up, and with a few large scales scattered higher; *fr.* lanceolate-acuminate, sometimes much attenuate at apex, lowest pair of pinnæ hardly shorter than next two pairs above, 5—14 in. l., and up to 6 in. br., bi-tripinnate, and sometimes deeply quadripinnatifid; *pinn* 15—20 pairs besides the pinnatifid apex, distant, lowest pair subopposite, others increasingly alternate until all are equi-distant, lanceolate and sometimes much acuminate, subequal-sided, lowest pair broadest and sometimes with inferior pinnules next the stipe enlarged; rhachis of pinna slightly winged; *pinnl.* up to 12 pairs besides the pinnatifid apex, those on superior side of pinna slightly longest except sometimes on lowest pair of pinnæ, in fully fertile fronds cut down to a winged rhachis, leaving up to 6 pairs of tertiary segments free, which again are deeply cut down into three or more unequal-sided lobes either simple and non-soriferous, or cleft into unequal horns and then soriferous; *texture* herbaceous; *colour* of fronds olive green, —of stipes and rhachises more or less pink; *veins* of tertiary divisions pinnate in the lobes: veinlets of lobes simple or abruptly branched into two parts curving round into the hooked horns of the ultimate soriferous lobes; *sori* one at the base of each cleft lobe across the forked veinlet; *invol.* persistent, nearly as wide as the cleft lobes. (Plate I.)

PUNJAB: *Kullu* 9-10,000′, Trotter; *Simla Reg.* 8-10,000′, Collett, Blanf., Hope, Bliss, Lace: common at these elevations.

N.-W. P.: *D. D. Dist.—Jaunsar* 7-9000′, Herschel, Duthie, Gamble, Mrs. Stansfield; *T.Garh.* 8-10,000′, Lev., Mackinnons, Gamble; *Brit. Garhwal* 8-10,000′, Duthie; *Kumaun* 8-12,000′, Duthie, Trotter, MacLeod.

DISTRIB.—*Asia*: N. Ind (Him.)—Nepal; Sikkim; Bhotan.

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* The serial numbers prefixed to the New Species show their place under each genus in the General List (Part III), where the names only will be repeated.

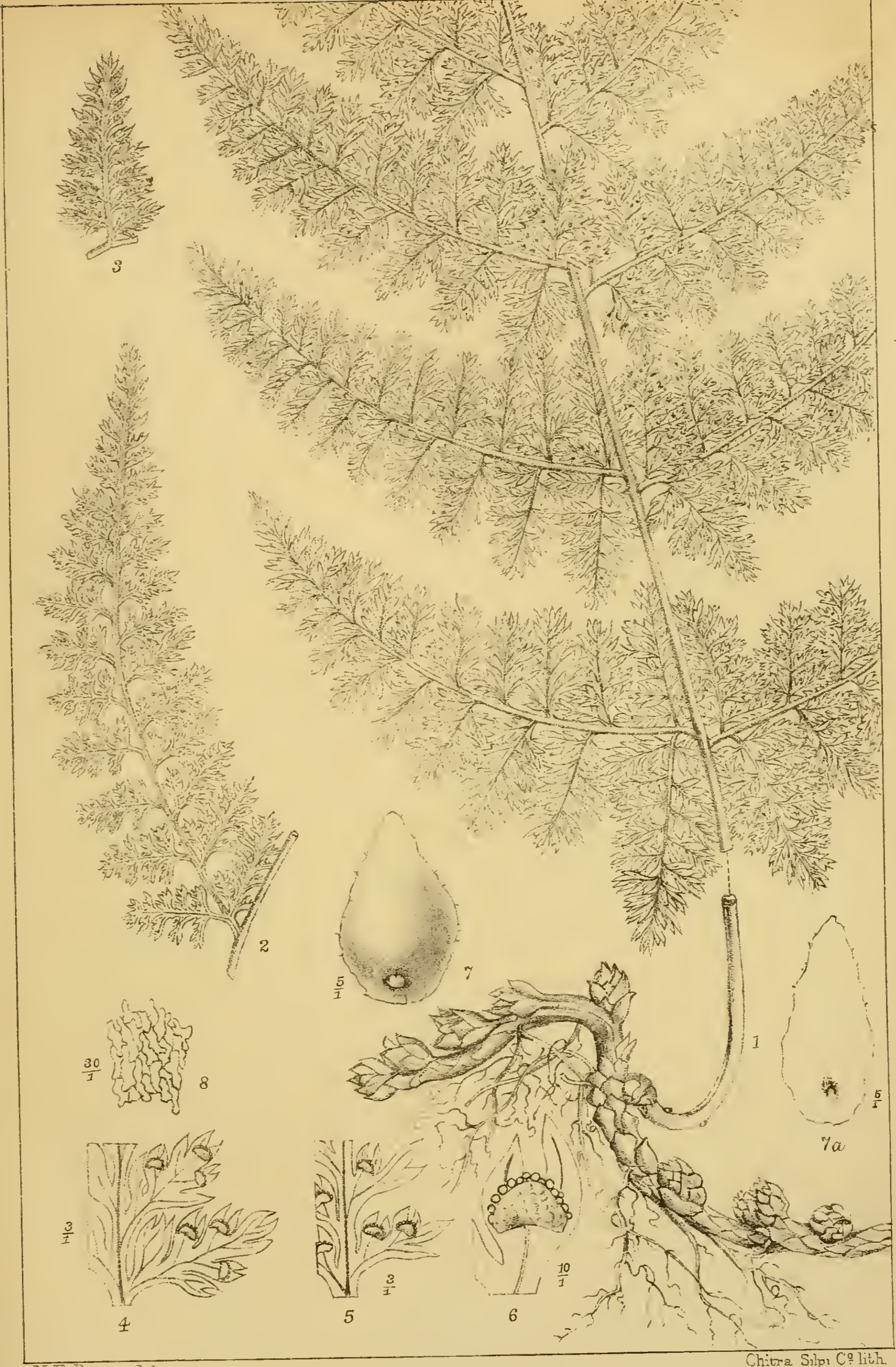
I dedicate this beautiful species to Colonel Beddome, who has done so much for ferns, and who has shown me that it is undescribed. It is the high-level plant which is not got in the parts of the Himalaya most frequented by Europeans, and consequently has been seen growing, or noticed, by few collectors. It can never be mistaken, in growth at least, for the low-level plants, so common in the outer range of the Himalaya, be these *D. pulchra*, or *D. pseudocystopteris*, or *D. Delavayi.* The fronds are never deltoid, or even subdeltoid, in shape, as are those of *D. pulchra* and *D. pseudocystopteris*, and the stipes are generally comparatively short, and, like the rhachis, pinkish in colour, which tinge gives a character to the plant. The large, broad scales of the rhizome, suggesting pale-coloured raisin skins, are very characteristic. It is sometimes difficult to separate the members of this group by their ultimate cutting, as that seems to vary with age of fronds and degree of their fertility; but I consider the difference in shape of fronds, in scales, in colour, and in habitats to be quite sufficient distinction. Blanford, who called this plant *D. pulchra*, Don, said—"The typical form, distinguished by its red rhachis, obtuse segments and ovate scales of the rhizome, is abundant on trees on Kamalhori and Hatu (Mts.) above 8,500 ft., but does not occur lower."

Genus 12—CHEILANTHES, Sw.

6. **Cheilanthes dubia,** n. sp.—*Caud.* erect, undistinguishable—hidden by the numerous stipes; *st.* densely tufted, stout, round, about as long as the fronds, when young—thickly covered with linear-lanceolate hair-pointed scales with dark centres, which diminish in size and become paler in colour upwards, and are there mixed with small, pale-brown, chaffy scales and tomentum; when old, less densely clothed, and then appearing glabrous and almost black between the scales; *fr.* lanceolate, sometimes 1 ft. and upwards in length, pinnate; *pinn.* pinnatifid nearly to the rhachis, lower pinnæ as long as or longer than those next above, and with lower sides enlarged; *fr.*, of two sorts, (1)—the broader herbaceous in texture, with pinnæ and segments broad, destitute of powder beneath, secondary rhachises and costæ with a few, narrow, pale-brown scales, but no tomentum; *invol.* distinctly separate at tips of veins, often not extending to apices of segments, and often without sori, (2)—the narrower coriaceous in texture, with pinnæ and segments shorter and narrow; *rhachises* and costæ densely clothed with pale-brown to nearly white broad and also long chaffy scales, and tomentum, and under surface of lamina completely covered with white powder; *invol.* broad, confluent, all round the segments, much lacerate and ciliated. (Plate. II.)

N.-W. P.: *D. D. Dist.*—On the cart road from Rajpur to Mussooree, at about 4,000 ft. altitude.

PLATE I.



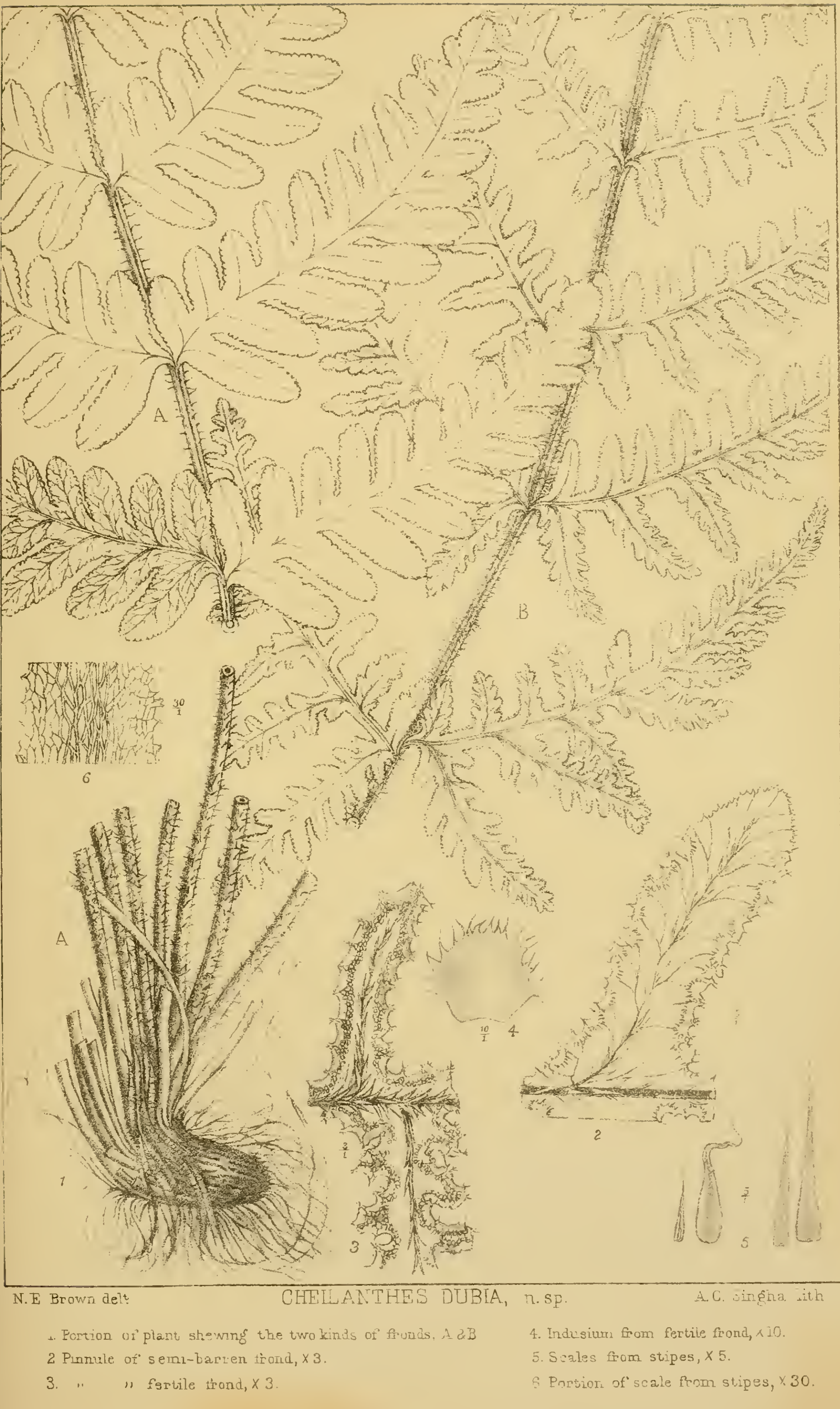
N.E Brown del.

Chitra Silpi Cº lith.

DAVALLIA BEDDOMEI, n. sp

1. Rhizome and part of a frond, natural size.
2 & 3. Entire pinnæ from the middle of two other fronds, natural size.
4. Portion of a pinnule from the frond fig. 1, magnified 3 diameters.
5. Portion of a pinnule from the pinna fig 2 magnified 3 diameters.
6. Sorus with indusium, magnified 10 diameters.
7 & 7a. Scales from rhizome magnified 5 diameters.
8. Cells from the middle of a scale, magnified 30 diameters.

PLATE II



N. E. Brown delt. CHEILANTHES DUBIA, n. sp. A. C. Singha Lith.

1. Portion of plant shewing the two kinds of fronds. A & B
2 Pinnule of semi-barren frond, X 3.
3. " " fertile frond, X 3.
4. Indusium from fertile frond, X 10.
5. Scales from stipes, X 5.
6 Portion of scale from stipes, X 30.

This fern grows near the highest range of *C. rufa*, Don, and at about the lowest range of *C. albo-marginata*, Clarke, which two species are very unlike each other in general appearance and habit, perhaps agreeing only in having two sorts of fronds, differing as above described. It is much larger than *C. rufa*, and has the general appearance of very large plants of *C. albo-marginata*, except that none of its fronds are deltoid as some of those of the other species are; but it bears fronds some of which might be referred to one species and some to the other, and, as I cannot refer it as a whole clearly to either, I give it an independent name. It may be a hybrid between *C. albo-marginata* and *C. rufa*.

Colonel Beddome says (Handbook, p. 94), under *C. rufa*—"Very near the last species" (*C. albo-marginata*) "only tomentose. I have some specimens from Garhwal. I hardly know which to refer to, the tomentum being present, but very sparse; the difference between the two is only a question of the tomentum, and both may well be varieties of *farinosa*." I lived for sixteen years in Dehra and Mussooree in the midst of these species of *Cheilanthes*, and I must say I know of no three species of any genus which are more markedly separate in character and general appearance than these three are. *C. farinosa*, in those parts at least, never varies, and is as typical when growing in the Raspana Valley at Rajpur alongside of *C. rufa* as it is many miles south of any known habitat of that fern. *C. albo-marginata* looks quite a different plant when growing in exposed rock crevices, or on walls, from itself growing in soil and shade, but it is always clearly distinguishable from *C. rufa*. *C. rufa* is always spread out flat on the face of the rock in which it is rooted, though occasionally it grows in soil above or below rocks. I think I have never seen *C. farinosa* rooted in rock. I do not think Colonel Beddome has ever seen *C. rufa* growing. He has probably been misled by the fact that both that species and *C. albo-marginata* are somewhat dimorphous, though where the resemblance of either to *C. farinosa* is I cannot see.

Genus 20—ASPLENIUM, *Linn.*

Subgenus—ATHYRIUM, *Roth.*

22. Asplenium tenellum, n. sp.—*Allantodia tenella*, Wall. in Herb. 1821, under *Asplenium tenuifrons*, Wall. Cat. No. 206. *Plants* isolated, 10—22 in. high, according to age; *caud.*, erect, small: *st.* tufted; or, if constrained, procumbent, and stipes springing in close longitudinal sequence: a few lanceolate-acuminate brown scales on base of stipes; *st.*, except close to base, naked, slender, sometimes nearly equaling the frond in length; *fr.* broadest at middle or below it, narrowing slightly towards the base and rapidly towards the acuminate apex, bipinnate, 6—13 in.

l., rarely longer, 3—6 in. br. ; *pinn.* 10—18 pairs (according to size of frond) besides the acuminate apex, well apart, stalked, ovate-acuminate, 1½—3 in. l., ½—1 in. br., sometimes broadest at base, generally like the frond in miniature ; secondary rhachis flat above, keeled below, becoming winged above the lowest few pairs of pinnules ; *pinnl.* 6—12 pairs below the acuminate apex of the pinna, oblong and blunt to falcate, unequal-sided, lower side cut away, divided more or less deeply into 4—6 pairs of blunt toothed lobes or segments ; upper surface furnished with long weak *setæ* springing from the sides of the secondary rhachis and the costa of the pinnule, and in large fronds also from the veins ; *texture* herbaceous ; *ven.* pinnate in the pinnules, and forking in the ultimate segments ; *sori* in a double row close to the costa along the vein and the superior veinlet of each lobe, sometimes one, or a pair, away from the costa in the anterior lowest segment ; *invol.* persistent, opening towards the costa or the main vein of the enlarged lowest segment. (Plate IV.)

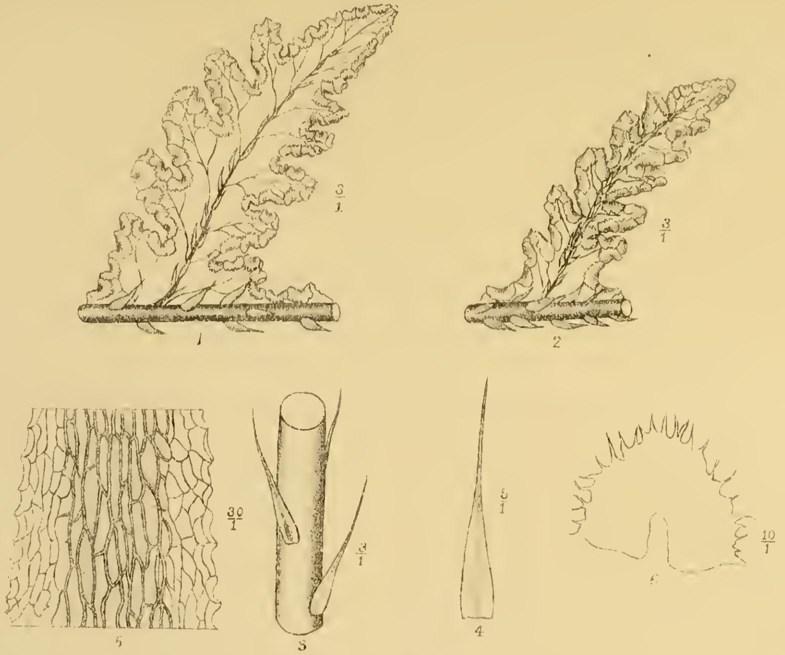
Hab. :—Kash. : *Kishtwar*, T. T. 14-11-48. Punjab :—*Simla Reg.*—Simla 6-7000′, Blanf. 1883, Bliss 1891. N.-W. P. : *D. D. Dist.*—Sowárna Nála 4500′, Mackinnons 1878-79, P. W. Mackinnon and Hope 1881 ; *Kumaun*—Jagesar and Phurki 6000′, S. and W. 1848 ; near Naini Tal 5500′, Hope 1861 ; Rálam Valley 7-8000′, Duthie No. 3624, 21-8-84 ; Khàti to Dwáli 70-7500′, Trotter No. 817, 1891 ; Gori Valley above Bugdiár 9000′, MacLeod 1893.

Distrib.—*Asia* : N. Ind. (Him.) W. Nepal : Nampa Gadh 12-13,000′, J. R. Reid 1886, com. Duthie No. 6244 : very long. Nepal, *Wallich*, *Duthie*.

A small and elegant plant, found on wet rocks, or by the side of small streams, in forests on the Himalaya. Intermediate between *A. nigripes* and *A. tenuifrons*, Wall. Distinguishable from the former by the shorter stipes, more delicate habit and more elegant cutting, and distinguishable from *A. tenuifrons* by the smaller size of the plant, slender stipes, generally more attenuate pinnæ, and by not being proliferous towards the apex of the fronds.

A. tenellum, Wall., is given in Hooker and Baker's *Synopsis Filicum* as merely a form of *A. Filix-fœmina*, Bernh., "with the midrib of the pinnæ and pinnules beset with firm yellow spines or strigillæ ;" but in the living state the two plants are altogether unlike. In the Wallichian collection in the Herbarium of the Linnean Society, there is only one frond ticketed by Wallich, *Allantodia tenella*, Wall., "Legi in Napalia 1821" : it is long and narrow—11⅓ in. l., 4 in. br., with sori very costal, like the Sikkim high-level plant which Mr. Clarke called *var. alpina* of *A. nigripes*, and the Khasi Hill specimens alluded to in this paper under *A. nigripes* : the pinnæ are distant and very narrow—about ½in. br. only, and just enough of the upper surface is visible to show that it is setulose. In the British Museum Herbarium there are two sheets marked "*Allantodia tenella*, Wall. in Herb. 131" (possibly

PLATE III. A.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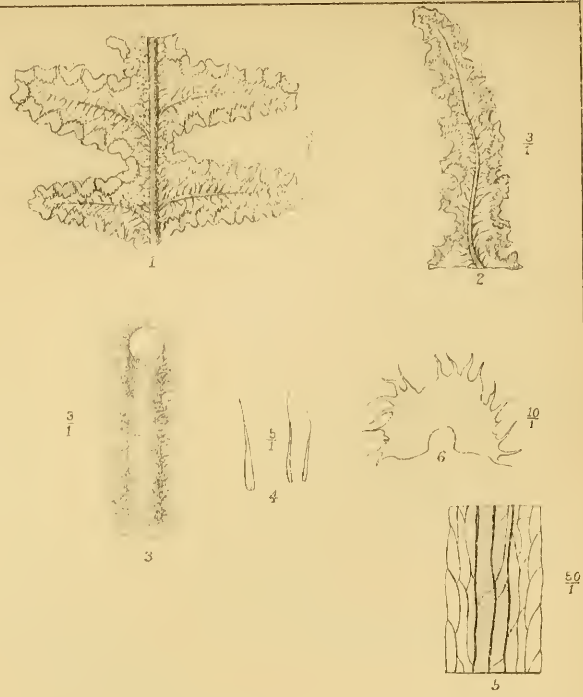
6

N.E.Brown del.

CHEILANTHES ALBOMARGINATA, C. B. Clarke

1. Pinnule from broad frond, × 3.
2. ,, ,, narrow frond, × 3.
3. Portion of stipes, × 3.
4. Scale from stipes, × 5.
5. Portion of scale from stipes, × 30.
6. Indusium, × 10.

PLATE III. B


1
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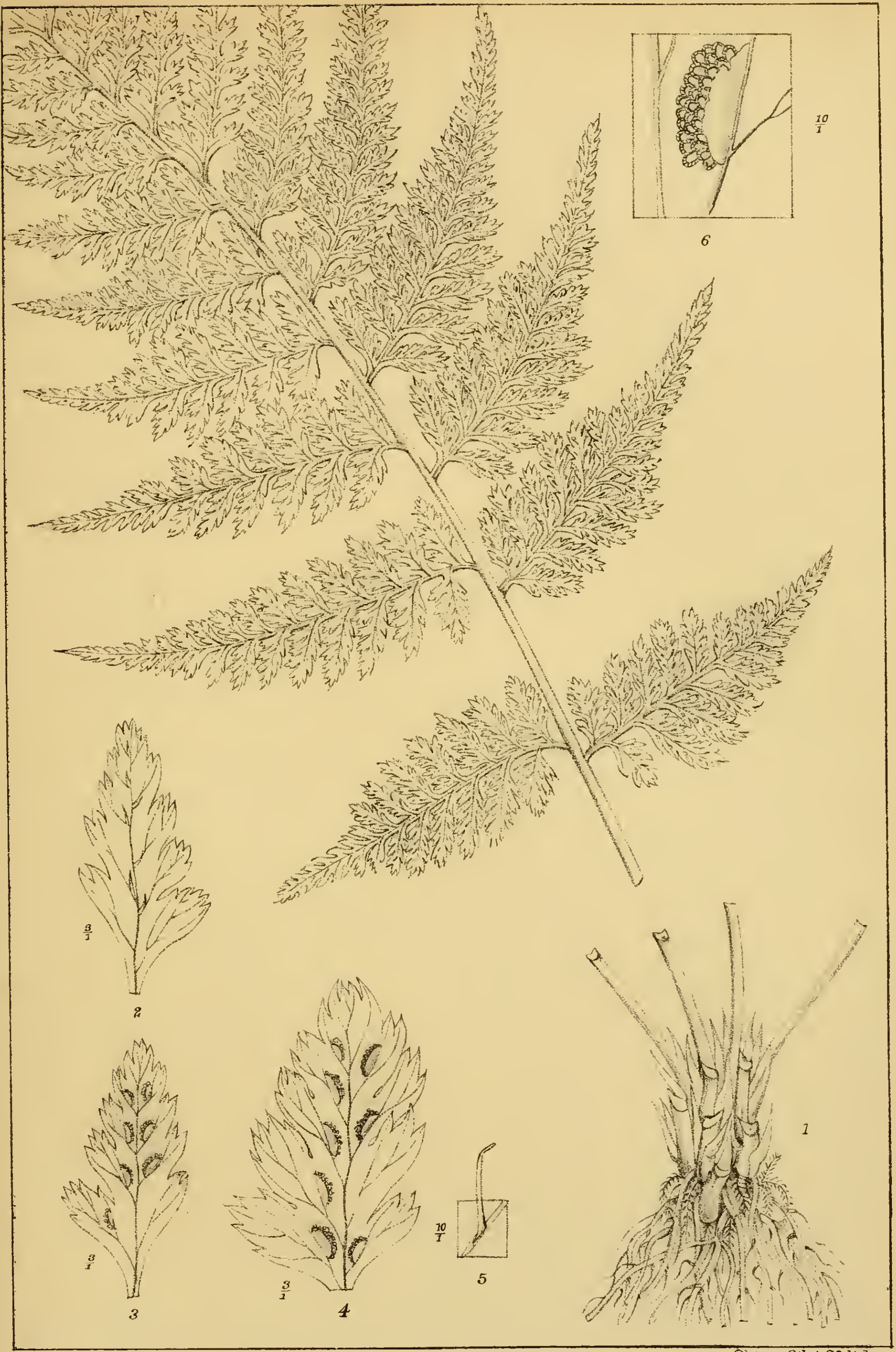
4
10/1
6
50/1
5

A.C.Mukerjei lith.

CHEILANTHES RUFA, Don.

1. Part of a pinna from a bipinnate frond, × 3.
2. An entire pinna, from a pinnate frond, × 3.
3. Portion of stipes, × 3.
4. Scales from stipes, × 5.
5. Fragment of scale from stipes, × 50.
6. Indusium, × 10.

PLATE IV.



N. E. Brown. del.

Chitra Silpi Co. lith.

ASPLENIUM TENELLUM. n. sp.

1. Rhizome and part of frond, natural size.
2. Upper, and 3, under side of pinnule from an ordinary frond, × 3.
4. Pinnule from a broad frond, under side, × 3.
5. Fragment of a pinnule showing bristle on upper surface, × 10.
6. Fragment of a pinnule showing sorus with its indusium, × 10.

Cat. No. 231 is meant, as *A. pectinatum*, Wall. Cat. 231, with some *A. nigripes*, is mixed).

Moore, in the *Index Filicum*, gives *Allantodia* (?) *tenella*, Wall. as a synonym of *Athyrium tenuifrons*, Moore.

26. A. rupicola, n. sp.,—*Plants* isolated; *caud.* suberect or procumbent, slow-growing; *st.* densely tufted, springing from all round the caudex, short and thick and curving towards the vertical, the bases persistent, clothed with narrow hair-pointed dull brown scales, above glabrous; *fr.* narrow lanceolate, acuminate at apex, simply pinnate, deeply pinnatifid, naked except for a few fibrillæ on main rhachis, herbaceous to subcoriaceous, generally curving laterally near the base reversely from the direction of the stipes, the lower pinnæ becoming distant and dwindling in size; up to 15 in. l. and probably more, by 3—4 in. br., rarely broader; *pinn.* 20 or more pairs besides apex, becoming distant towards the base of the frond, sessile and decurrent both ways on rhachis which becomes winged towards apex, $\frac{3}{8}$—$\frac{3}{4}$ in. br., falcate, broadest at base and anterior lowest segment longest cut down sometimes nearly to the secondary rhachis into broad falcate segments spinulosely toothed at point and on both sides, or, in large specimens, lobed, and then the lobes spinulosely toothed in correspondence with the veinlets; *ven.* pinnate in the segments; *veinlets* one to each tooth or lobe, and forked in the lobes; venation distinct on the lower surface; *sori* one to each vein, on the anterior veinlet of each lobe, or in the fork of the veinlets, short, straight, or sometimes hippocrepiform, looking large and roundish when ripe; *invol.* brown. persistent at least till sori ripen. (Plate V.)

The above description has been written from fifteen sheets in my possession: there is no other description, except that Beddome gives *A. rupicola*, Edgew., as a synonym of *A. Filix-fœmina, var. retusa*, Clarke, which he describes briefly. Some at least of Clarke's *retusa* is quite different from the present species.

HAB.—KASHMIR, Pir *Punjal*, south slope 9000′, Lev. 1875. PUNJAB—*Chamba* 8000′, Baden-Powell 1879, 9000′ McDonell; *Kullu* 7-8000′, Trotter; *Mandi State* 9-10,000′, Trotter; *Simla Reg.*—Simla, Edgew., and Nagkanda 29-9-31, Lady Dalhousie, Herb. Wight, in Herb. Hort. Kew, 7800′, Bliss; Ridge east of Simla from Mahasu to Baghi 8-10,000′, Gamble, Collett, Blanf., Hope, Trotter, Bliss.

N.-W. P.: *D. D. Dist.*—Jaunsar 7500′, Gamble; Mussooree 7000′, Hope (once seen). *B. Garh.*—near Kuári Pass. 11-12,000′, Duthie No. 5150; *Kumaun*—Naini Tal Davidson 1875, China Mt. 8500′, Trotter; Byans—Pálang Gadh 9-10,000′, Duthie; Pindar Gorge 9-10,000′, Trotter No. 885 (whole plant 5 in. high, fronds fertile, 1 in. br.); Gori Ganga Valley—Bugdiar 8600′, MacLeod.

This is a very distinct species, both in structure and habit. It grows in the crevices of dry exposed rocks, and, late in the season at least, always has stumps remaining of stipes representing fronds larger than any then existing. Probably the longer fronds get broken off by the wind, or cropped by cattle or goats, during the rainy season. Blanford had been calling the plant *A. Schimperi*, A. Br., narrow form; but when I collected it in 1886 I thought it distinct and new, and proposed to call it *A. rupestre.* On going to Kew in 1888 I found a specimen collected by Edgeworth, and named by him *A. rupicola.* Meanwhile, Mr. Blanford seems to have entered the fern in his list of the Ferns of Simla (Journ. Asiat. Soc., Beng. 1888) as *A. Filix-fœmina*, var. *retusa*, Decne., subvar. *elongata*, Clarke, from sheets at Kew so marked by Clarke. This subvariation is too metaphysical for me, and, as the plant is unlike *A. Filix-fœmina* in every respect, I give it as a species, and adopt Edgeworth's name as being very appropriate. I disagree with Beddome when he says that the fronds are very similar to those of *A. Schimperi*, A. Br., but almost always only bipinnatifid. *A. rupicola* is very gradually narrowed towards the base, whereas *A. Schimperi* is hardly narrowed at all; and I have never seen the first-named species with fronds even nearly bipinnate; but probably Beddome, as Clarke does, includes in the variety *retusa* of *A. Filix-fœmina* other plants which I do not know. In the Calcutta Herbarium I found, and separated, a good many specimens of *A. rupicola*, but I omitted to note particulars regarding them.

Genus 22—ASPIDIUM, *Sw.* (in part). *R. Br.*

Subgenus—POLYSTICHUM, *Roth.*

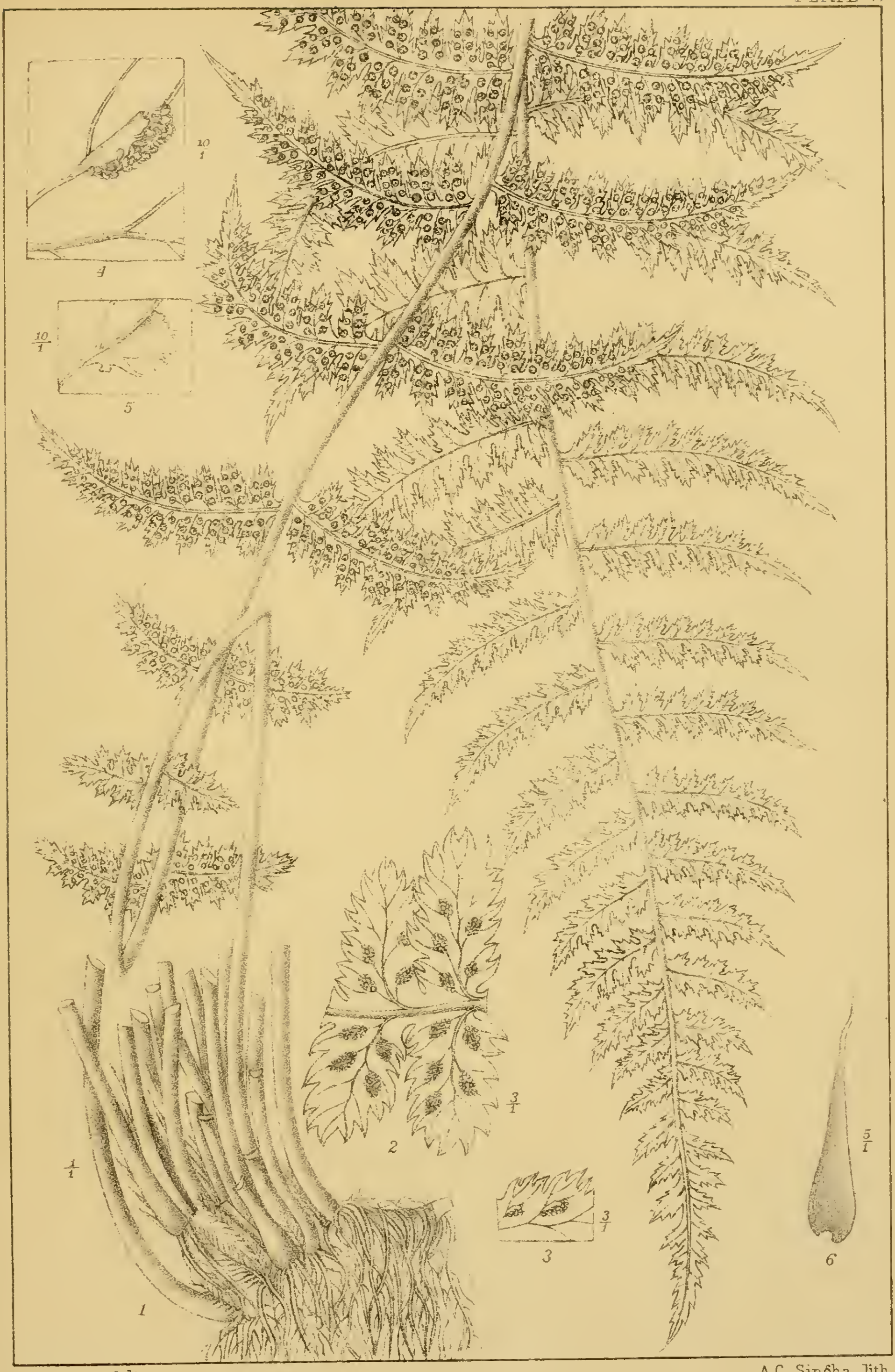
3. **Aspidium Duthiei**, n. sp.—*Plants* with erect caudices in dense tufts; *st.* short, stout, 1—2 in. long, densely clothed with large pale-drab, almost straw-coloured, scales, which extend up the *rhachis* to the apex of the frond, diminishing in size upward, and along the costæ on both surfaces, underneath protruding from among the sori; *fr.* 2—4, 5 in. l., narrow, linear, simply pinnate; *pinn.* short, blunt, hardly auricled, broadened at base on both sides, merely lobed or crenate above, markedly alternate; upper surface covered with small white glands or setæ; *texture* subcoriaceous; *sori* about 4 pairs to a pinna near the costa. (Plate VI.)

N.-W. P.: *T. Garh.*—Dudu Glacier 14-15,000′, Duthie No. 396, 19-8-83; Kutti Valley, above Napálcha, 13,300′, Duthie No. 3708 (in part); *Kumaun*—Lebong Pass 16-17,000′, Duthie No. 6234, 1886.

NEPAL, WEST—Nampa Gádh 13-14,000′, Duthie No. 6233, 1886.

I have felt obliged to separate this plant from *A. lachenense*, Hook., both because it differs from that plant in appearance, and because Hooker's description of *A. lachenense* cannot be made to cover it. Nor is that description correct for even the type plant, especially as to the cutting of the pinnæ, which can hardly

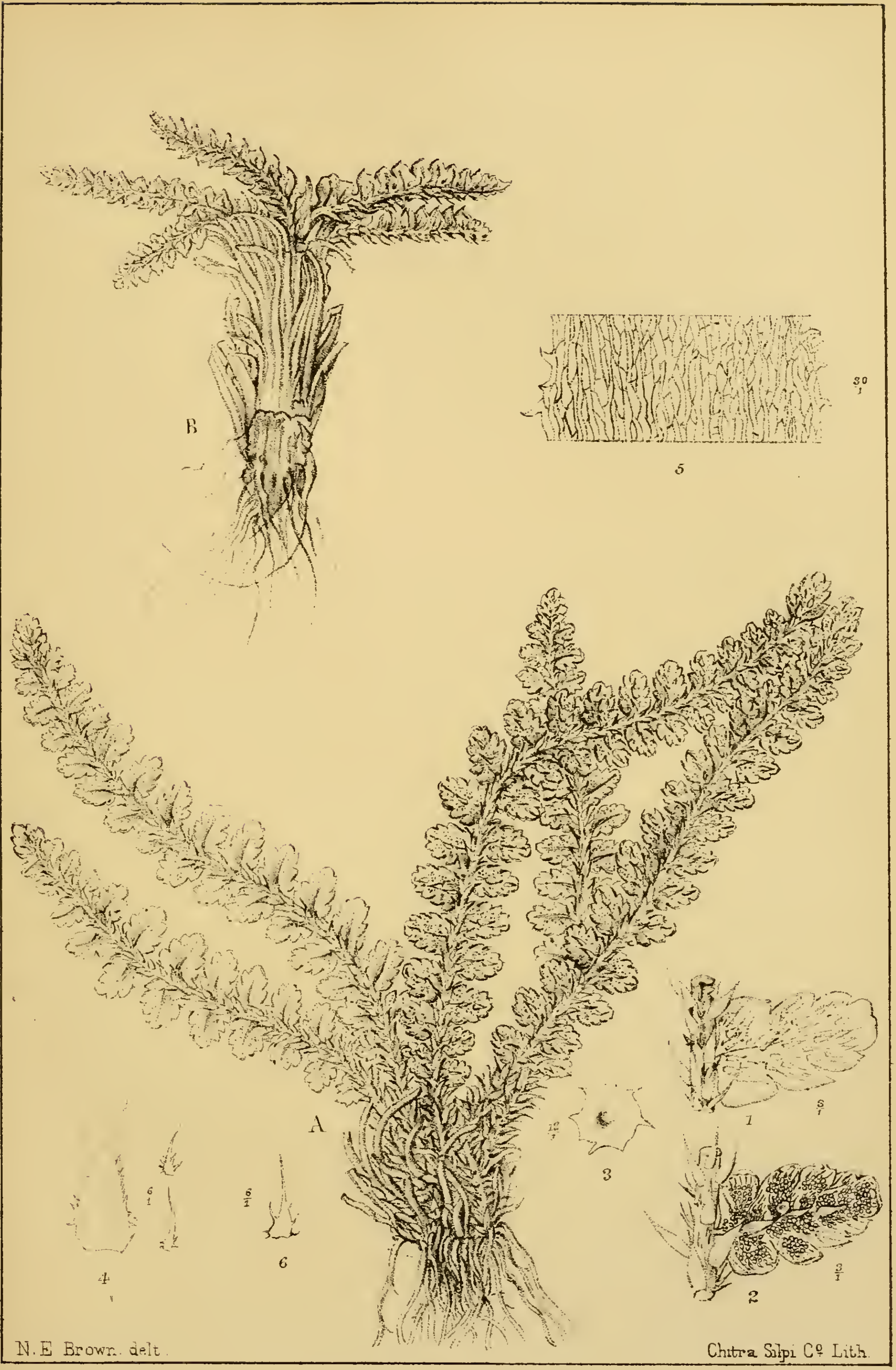
PLATE V.



N. E. Brown delt. A.C. Singha lith.

ASPLENIUM (§ ATHYRIUM) RUPICOLA, n. sp.

1. Rhizome & frond, natural size.
2. Base of a pinna, showing four pinnules with nature sori, enlarged 3 diams.
3. Fragment of a pinnule with 3-toothed lobes & sori with their indusia, enlarged 3 diams.
4. Young sorus with indusium, enlarged 10 diams.
5. Indusium flattened out, with the sporangia removed, enlarged 10 diams.
6. Scale from the apex of the rhizome.



N.E Brown. delt.

Chitra Silpi Cº Lith.

A.—Plant, natural size
B.— Dº Dº

ASPIDIUM DUTHIEI, n. sp.

1 Pinnule and part of stipes, upper surface, × 3.
2 ,, ,, ,, under ,, × 3.
3 Indusium × 12.
4 Scales from stipes × 6.
5 Portion of scale from stipes. × 30.
6 Scale from upper surface of pinnule, × 6

be called serrate, much less "spinoso-serrated" (Syn. Fil.), or "spinosely-serrated or crenate-serrate" (Bedd.). Clarke says—"Margin crenate-serrate, scarcely spinulose." I should say certainly not spinulose. The pinnæ of neither plant are auriculate, as those of most Polystichurns are. The distinguishing features of *A. Duthiei* are—the short and stiff stipes and stout rhachis; the dense covering of disproportionately large, very pale, scales; and the white *setæ* on the upper surface, and the coriaceous texture. Judging from the few plants which have been gathered, some with few fronds left on them, but with numerous stumps of thick stipes, this species produces larger fronds than have not been seen

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CORRECTION.

Vol. XII, page 533, fourth line from the top, *for* Polystichu*rn*s, *read* Polystichu*m*s.

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point, cut down $\frac{1}{4}$—$\frac{1}{6}$th towards *sec. rh.* into numerous segments, one for each main vein with margins rounded upwards from the sinus, the lower afterwards running parallel with the *sec. rh.* to an ogival mucronate point, margin sometimes undulate and slightly toothed; *texture* coriaceous, brittle when dried; *ven.* pinnate in the segments, lowest pair of veinlets taking off at or near costa of pinna and curving upwards to near the sinus, but sometimes stopping much short of it and then often not soriferous, others running into the lobes, and all stopping short of the margin and having thickened ends; *sori* small, 2—3 to a segment, on lowest pair of veinlets and next veinlet above, appearing grouped in triplets—two sori belonging to one segment and the third to the next superior segment; *invol.* shrivelling on top of ripe sori, but often persistent. (Plate VII—drawn from a Darjeeling specimen.)

PUNJAB: *Simla Reg.*—"Above Simla, Col. Bates," *fide* Hooker in Herb. Hort. Kew. "Lastrea atrata ?? Wall." N.-W. P.: "*Garhwal*"—P. W. Mackinnon 1881; *Kumaun*—S. and W. 1848, No. 3.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim—Darjeeling 6-7000′, Gamble 1879, Nos. 6968 and 7075, Lev. 1899, 7000′; Bhotan—Dhumsong 6000′, Gamble 1876, No. 254; Assam—Shillong, Clarke 44635, 1886.

be called serrate, much less "spinoso-serrated" (Syn. Fil.), or "spinosely-serrated or crenate-serrate" (Bedd.). Clarke says—"Margin crenate-serrate, scarcely spinulose." I should say certainly not spinulose. The pinnæ of neither plant are auriculate, as those of most Polystichums are. The distinguishing features of *A. Duthiei* are—the short and stiff stipes and stout rhachis; the dense covering of disproportionately large, very pale, scales; and the white *setæ* on the upper surface, and the coriaceous texture. Judging from the few plants which have been gathered, some with few fronds left on them, but with numerous stumps of thick stipes, this species produces larger fronds than have yet been seen.

Genus 23—NEPHRODIUM, *Rich.*

Subgenus—LASTREA, *Presl.*

4. **Nephrodium Gamblei,** n. sp.—*Plants* isolated; *caud.* erect or suberect; *st.* stout, 9—24 in. l., densely clothed throughout with long dull-brown scales up to $1\frac{1}{4}$ in. l. by $\frac{3}{16}$ in. br., which diminish in size rapidly and get darker in colour above two or three inches from the rhizome; *rh.* similarly clothed throughout with dark brown or black hair-like scales which extend a short way along the *sec. rh.*; *fr.* simply pinnate, $1\frac{1}{2}$—3 ft. l. by 9—13 in. br.; *pinn.* up to 30—35 pairs, very shortly stalked, cordate with bases sometimes overlapping the prim. rh., narrow, generally broadest at base owing to enlargement of lowest pair of segments, above that $\frac{5}{8}$—$\frac{7}{8}$ in. br., hardly narrowed below middle of length, and above that gradually to a not very acuminate point, cut down $\frac{1}{4}$—$\frac{1}{6}$th towards *sec. rh.* into numerous segments, one for each main vein with margins rounded upwards from the sinus, the lower afterwards running parallel with the *sec. rh.* to an ogival mucronate point, margin sometimes undulate and slightly toothed; *texture* coriaceous, brittle when dried; *ven.* pinnate in the segments, lowest pair of veinlets taking off at or near costa of pinna and curving upwards to near the sinus, but sometimes stopping much short of it and then often not soriferous, others running into the lobes, and all stopping short of the margin and having thickened ends; *sori* small, 2—3 to a segment, on lowest pair of veinlets and next veinlet above, appearing grouped in triplets—two sori belonging to one segment and the third to the next superior segment; *invol.* shrivelling on top of ripe sori, but often persistent. (Plate VII—drawn from a Darjeeling specimen.)

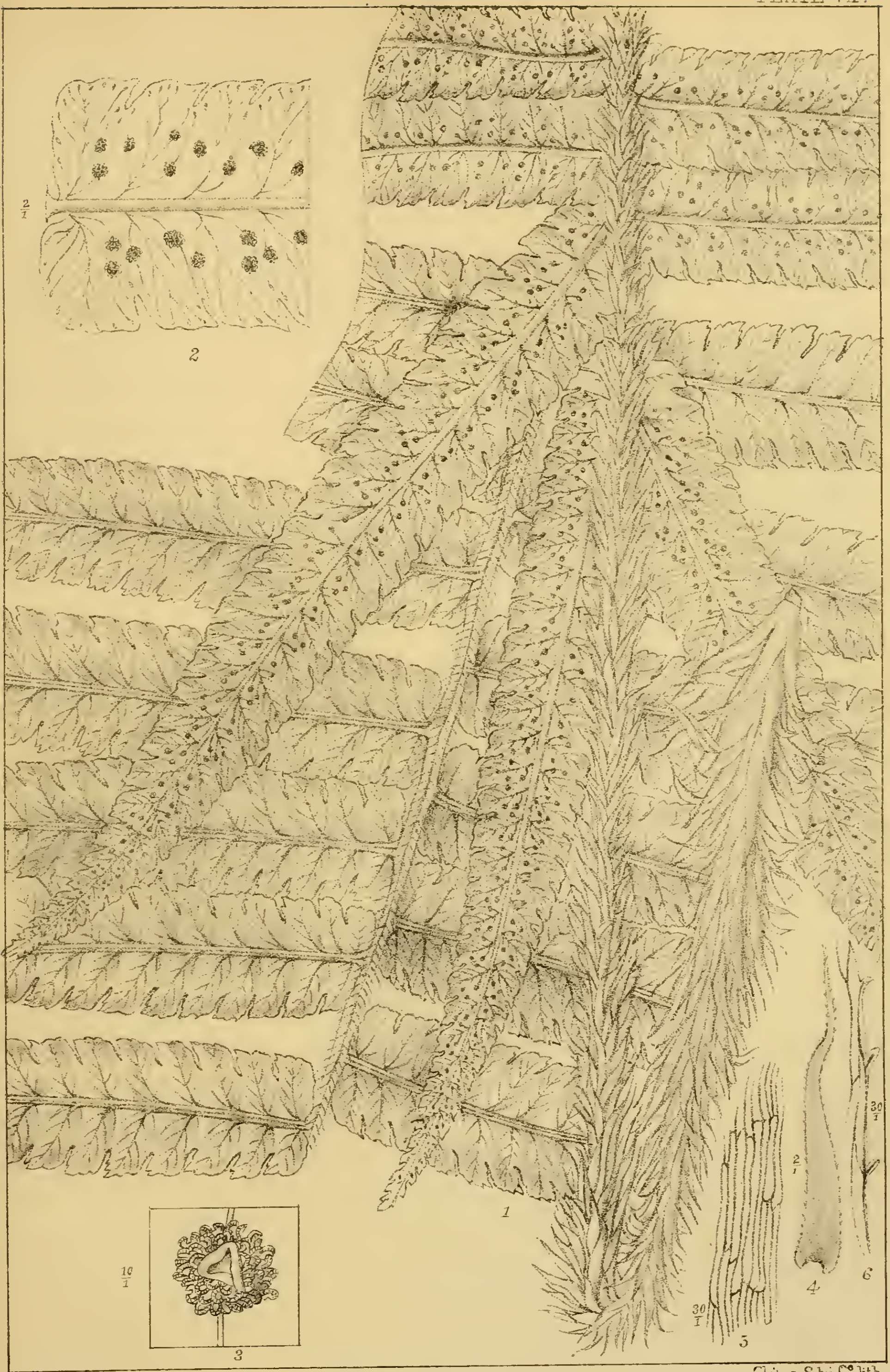
PUNJAB: *Simla Reg.*—"Above Simla, Col. Bates," *fide* Hooker in Herb. Hort. Kew. "Lastrea atrata ?? Wall." N.-W. P.: "*Garhwal*"—P. W. Mackinnon 1881; *Kumaun*—S. and W. 1848, No. 3.

DISTRIB.—*Asia*: N. Ind. (Him.) Sikkim—Darjeeling 6-7000′, Gamble 1879, Nos. 6968 and 7075, Lev. 1899, 7000′; Bhotan—Dhumsong 6000′, Gamble 1876, No. 254; Assam—Shillong, Clarke 44635, 1886.

Many years ago I separated, from among *Nephrodium F. mas*, var. *parallelogrammum*, Kze. in Linnæa, *Hook*, in the collection of the Messrs. Mackinnon, several specimens as differing in cutting and venation. And more recently I observed in Mr. Gamble's collection, in the *N. hirtipes* wrapper, the specimens above enumerated from Darjeeling, Bhotan, and Shillong, the two latter sets having been marked by Mr. Clarke *Lastrea hirtipes*. On the ticket of No. 7075 Mr. Gamble had written—"This seems to be placed by Clarke together with what we have usually considered true 'hirtipes' (*see* my No. 7154), but the two ferns are quite distinct in locality and habit. No one gathering them together in Darjeeling could say they were the same!" When I told him I agreed as to this specific difference, and that I proposed to describe the plant as a new species, Mr. Gamble gave me this specimen. Except that the frond and pinnæ are narrower, and that the scales on it are paler, I cannot see that the North-West Indian plant is different. The venation is like that of *N. hirtipes*, but with perhaps more veinlets in a group. I have not seen either plant growing; but even without the support of Mr. Gamble, who has gathered both, I should have no hesitation in describing the present as a new species, distinct from *N. hirtipes*—the principal points of difference being (1) the stouter stipes and rhachis; (2) the more numerous and narrower pinnæ—the lower ones deflexed; and (3) the fewer *sori*. The free portion of a segment resembles in outline the head of a bird with a small beak.

I observed some specimens of *N. Gamblei* in the Calcutta Herbarium, but had not time to note particulars of them. In Mr. Levinge's collection in the Dublin Museum I have lately seen a very fine specimen of this fern, named *N. hirtipes*, which I noted as having a thick stipe 19½ in. l. with a frond 28 in. l. by 13 in. br. below the middle, and almost 12 in. at the base measured along the deflexed pinnæ. There are about 35 pairs of pinnæ, besides the abruptly narrowed apex. The texture is coriaceous. And in the Edinburgh Herbarium—which has lately been greatly enriched by the acquisition of the late Colonel F. Henderson's collection of ferns—I found a still larger, though imperfect, frond which must have been 3 ft. in length, besides the incomplete stipes which is 22 inches. This is the Bhotan specimen cited above, and Mr. Gamble's ticket bears—"*Nephrodium hirtipes*, Hook., ex C. B. Clarke, but in my opinion a different species." With this specimen, which is unmounted, is a loose slip, in Mr. Levinge's writing, as follows:—"We always called this fern *L. cuspidata* here; but it clearly is not. It differs from the typical *L. hirtipes* considerably, especially in habit, growing in great tufts like *L. patentissima*. I think it should be considered a variety (initialed) H. C. L. 14-11-80." Another slip in Colonel Henderson's writing bears:—"These specimens are

PLATE VII.

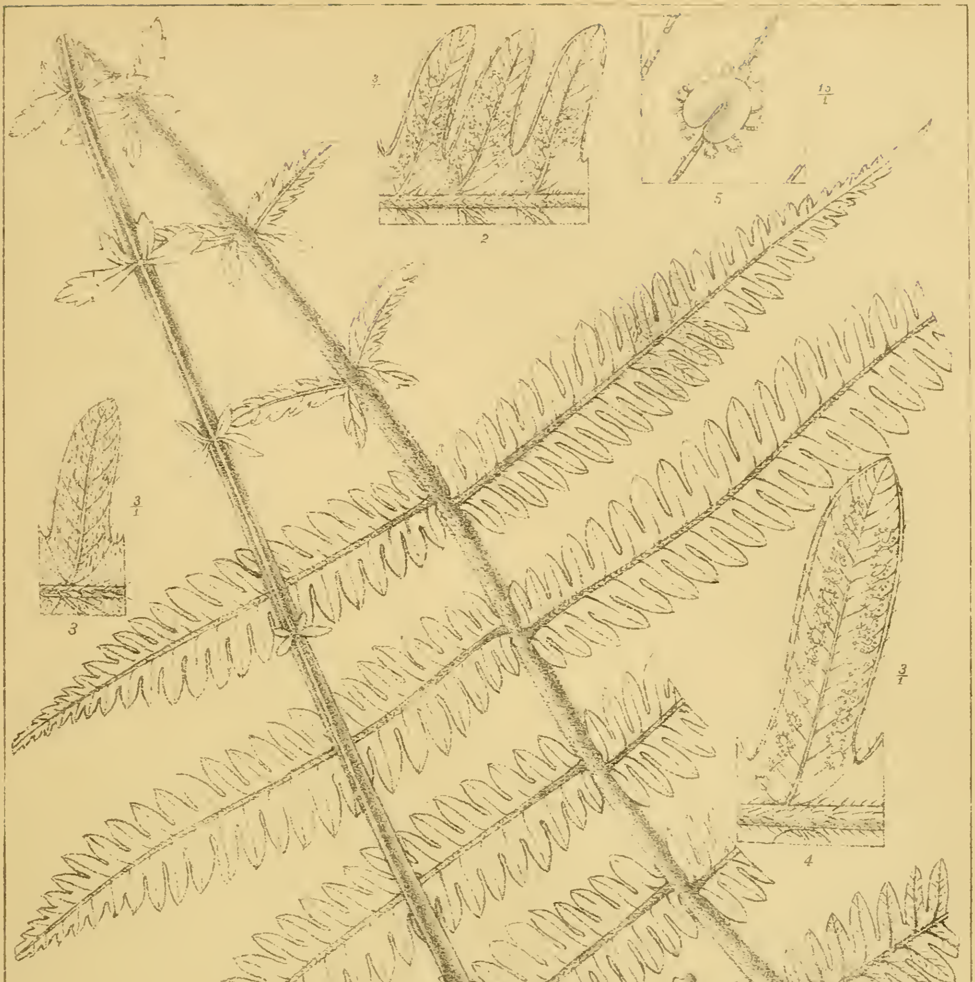


N.E.Brown. del.

Chitra Silpi Cº lith.

NEPHRODIUM GAMBLEI, n. sp.

1. Small frond, natural size.
2. Base of a pinna, under surface, magnified 2 diameters.
3. Sorus with indusium, magnified 10 diameters.
4. Scale from base of stipes, magnified 2 diameters
5. Cells from the centre of a scale, magnified 30 diameters.
6. Marginal cells of a scale, magnified 30 diameters.



N. E. Brown delt. NEPHRODIUM REPENS, n. sp. A. C. Singha lith

1. Rhizome & portion of a frond, natural size.
2. Three lobes of a pinna, under surface, × 3.
3. Lobe of a pinna, upper surface, × 3.
4. Lobe of a pinna from a large frond, under surface × 3.
5. Fragment of a pinna with sorus & indusium, × 15.

from the Himalayas, and though I suppose you will call them *L. hirtipes*, they seem to pass on and run into *Lastrea cuspidata*." I need not here consider whether *N. cuspidatum* and *N. hirtipes* are distinct species ; but I may say that I think *N. Gamblei* is the farther removed from *N. cuspidatum*. I have seen one or more specimens named *N. hirtipes* in Colonel Beddome's collection, which I should name *N. Gamblei*.

6. **N. repens**, n. sp.—*Rhiz.* widely creeping and branching, and throwing up fronds $\frac{1}{2}$ in. to 1 in. or more apart (sometimes forming dense beds) $\frac{1}{4}$ in. thick ; stiff and ligneous when dried ; *st.* naked or with a few deciduous scales at base only, upwards becoming downy or villose, as are the rhachises, 3—6 in. long below the auricles of the frond, rarely longer ; *fr.* ovate with an acuminate apex, but suddenly reduced below and continued by almost linear-auricles down the stipe, which dwindle in size until scarcely visible, auricles sometimes bipartite with segments pointing up—and downwards, simply pinnate, 2—4 ft. long including auricled base, by 6—12 in. br. ; *pinn.* numerous, close, not generally more distant towards base (but the auricles increasingly so), acuminate, width from $\frac{1}{2}$ to 1 in., rarely more, generally under $\frac{3}{4}$ in., cut down nearly to the sec. rh. into very numerous narrow parallel-sided round-pointed segments which are closely set—though always separated by a narrow sinus, slightly curved upwards at apices ; *texture* herbaceous or sometimes subcoriaceous, the costa thickly and the veins sparsely clothed on both surfaces with short hairs or down ; *ven.* of segments simply pinnate, attached to or abutting upon, but not branching from, the rhachis of the pinna ; *ven.* 6—18 pairs of veins, running out to the edge, the lowest pair just above the sinus ; *sori* small, one on each vein except near apices of pinnæ and segments, where they are wanting, medial or sometimes rather nearer the margin ; *invol.* glabrous, persistent, sometimes shrivelling. (Plate VIII.)

PUNJAB : *Chamba*—Chao (or Sao) 6000′, C. B. Clarke 23605, 7-10-74 (?) ; Ravi Valley 5000′, Blanf.; Chamba 6-7000′, J. Marten 1897 ; *Mandi State* 8000′, Trotter ; *Kullu* 6-7000′, Trotter ; *Simla Reg.*—Simla 5000′, Collett ; the Glen 6000′, Gamble; Usan Valley 4300′, Blanf.: " Common in ravines below 6000′," Blanf. in List (under *N. prolixum*) ; Bliss 1890, several stations. N.-W. P.: *D. D. Dist.*—Jaunsar : Rupin Valley 4500′, C. G. Rogers ; Tons Valley 3000′, Gamble ; "Dhoon" (in the Dehra Dun) Vicary ; Suàrna Nála 4500′, P. W. Mackinnon and Hope 1881 ; Sahasradhára 2000′, Hope ; Mussooree—in Herb. Dalzel, King, Herschel, Mackinnons, Hope ; *T. Garh.*—Phedi 4-5000′, Duthie ; *Kumaun*—Karim 6300′, S. and W. ; Naini Tal, Hope 1861 Chippleghát and Koonoor, Davidson 1871 ; near Askot 4-5000′, Duthie 1884 ; Nalena Valley 47-5000′, Hope 1890 ; near Báns 6500′, Trotter 1891 ; Kaini Valley—Shama 4200′, MacLeod 1893.

DISTRIB.—*Asia* : N. Ind. (Him.) Nepal—*Wallich* 349. Aspid. No. 29 ; " Legi in Napalia 1821 " ; Sikkim and Bhotan (?) ; Assam—Shillong 6000′, *C. B. Clarke. W.*

Afr. : Sierra Leone—near Free Town, *H. H. Johnston. S. Afr.*; Madagascar ? (*N. longicuspe*, Baker).

In giving habitats for this fern I am obliged greatly to assume from their other characters what sort of rhizome many herbarium specimens must have had. As already said, under *N. prolixum,* Baker, I have seen no plants of this section from North-West India with an erect caudex and tufted stipes. I should now add—except of the next species *N. xylodes*, Kze. In the *Synopsis* nothing is said as to the rhizome of *N. prolixum*, Baker, though that is sometimes the most important part of a fern ; nor does Willdenow mention that of his *Aspidium prolixum*. Nor does Clarke say anything as to rhizome, but says—" tufted, " meaning stipes in tufts, which I consider to imply that the caudex is thick and erect or suberect. Beddome is bolder, and in giving *Lastrea ochthodes*, of which he says *N. prolixum,* Baker, is a synonym, he writes—" Caudex erect, stipes tufted." And among all the specimens in the Kew Herbarium, named *N. ochthodes* and *N. prolixum*, there is not one with an erect caudex, and I think only one with a creeping one, namely, Mr. Clarke's No. 44652, collected at Shillong 6100′, 6-9-86 ; and to the fact of the creeping rhizome Mr. Clarke has called attention, as though it were an abnormality.

On referring to Kunze's description of *Aspidium ochthodes*, I find he says—" *Rhizoma juvenile tantum observavi*," and of *A. xylodes* he says only—" *rhizomate. . . . .* " As to the shape of the frond, Kunze says *A. ochthodes* differs from *A. xylodes* among other particulars in having " *basi sensim attenuata*"; and *A. xylodes* from the other, thus—" *basi abrupta contracta*." Kunze's *N. ochthodes*, therefore, has a frond gradually attenuated at the base, and not suddenly reduced to mere auricles as in *N. repens* and *N. xylodes*

Hooker in the *Species Filicum*, IV, p. 109, gives No. 87 *N.* (*Lastrea*) *ochthodes*, Hook., and for description a verbatim copy of Kunze's ; and then—" var. *a*, frond much attenuated at the base by the dwarfing of the pinnæ. *Aspidium ochthodes*, Kze. in Linnæa, XXIV, p. 282. Mett. Aspid., p. 82 ; var. β., the lowest pair (several pairs) suddenly abortive, reduced to large tuberculated glands. *Aspid. tylodes*, Kze., in &c. ; Mett. Aspid., p. 82, vix ab Aspid. ochthode diversum videtur. *Aspidium glanduliferum*, Wall. Cat. 347." Wallich's type sheet of No. 347, *Aspid. glanduliferum*, Wall. " Napalia 1821," is the plant I take to be *N. prolixum*, Baker, with pinnæ gradually reduced in length below and broadening into butterfly-shaped auricles : there is no rhizome ; the stipe, though incomplete, is 36½ in. l. ; and there are about 19 pairs of auricles diminishing in size to a mere trace only. Baker's *N. prolixum* is said to have a prominent gland at the base of the pinnæ. I can see no glands on any specimens of *N. repens*.

No. 349, *A. appendiculatum*, Wall., in the Linnean Society's Herbarium—"Aspid. No. 29 : Legi in Napalia 1821," named by Mr. Clarke—*N. canum* Baker, *v. prolixum*, Baker, is *N. repens* ; there is no rhizome, but the frond is suddenly diminished to mere short linear auricles, not butterfly-shaped : one frond is auricled for 21¾ in.

Mr. Blanford never gave *N. canum*, Baker, as other than a synonym of *N. prolixum*, and in his published paper (Journ. Asiat. Soc. Bengal, 1888) he said—"I include herewith the forms from Simla that have been referred to *N. canum*, the type of which is a specimen of unknown origin, grown at Kew, and having sub-marginal sori." (I may here remark that there are several pot plants in the Kew Temperate Fern-house ticketed *N. canum*, which are downy enough, but they have not creeping rhizomes and have stipes densely tufted as Baker's description says.) But in their joint "Supplementary Note on the Ferns of Northern India," read before the Linn. Soc., 3rd November 1887, Mr. Clarke and Mr. Baker gave "28. *Nephrodium canum*, Hook and Baker ; C. B. Clarke in Trans. Linn. Soc., ser. 2, Bot., Vol. I, p. 515. Simla, H. Blanford ; rhizomate horizontale brevi : sed in *N. prolixo* type. C. B. Clarke No.44652 rhizoma omnino simile videri potest." This shows that the Simla specimen from Blanford had a creeping rhizome, because Clarke's No. 44652 has ; though the entry seems intended to confirm the remarks made by Mr. Clarke in his "Review," 1880, in which he gave *N. canum* as a distinct species (No. 6) with tufted stipes—"I fear this is only a variety of *N. prolixum*." . . . . . "I can find no good distinction." Mr. Clarke then gave *Aspidium appendiculatum*, Wall., as a synonym of *N. canum*, and remarked—"*Of A. appendiculatum*, Wallich collected a large series ; the type sheet in his Herbarium is *N. canum*, Baker type."

Of *N. prolixum*, Baker, to which he attributed *N. canum* Baker, and *N. ochthodes*, Kze., as synonyms, Mr. Blanford wrote in an early paper, which was only privately distributed :—

> "Not uncommon in ravines below 6,000 feet." . . . "It differs in some respects from the descriptions of Clarke and Beddome. The caudex is decumbent, or shortly creeping, not erect." . . . "The lowest pair of pinnæ (sometimes two or three pairs) shorter, then suddenly reduced to auricles." . . . "What the *N. canum* may be, collected by Thomson and Edgeworth in the neighbourhood of Simla, unless herbaceous, glandless specimens of *N. prolixum*, I will not venture to surmise." . . . "I think it probable then that the Simla specimens of *N. canum* are simply *N. prolixum*."

It is improbable that Mr. Blanford, at the time the remarks above extracted were written, had ever seen a specimen of the N.-E. Indian *N. prolixum* with a rhizome attached ; and I conclude that, though nothing was said in the "Synopsis" about the rhizome, he believed with Mr. Clarke that the caudex was erect and the stipes tufted, and yet held that the Simla fern, with a caudex decumbent or shortly creeping, and with other differences, varied only slightly from *N. prolixum.* He does not say that it grows in isolated plants, with decumbent or shortly creeping caudices, and stipes in a tuft ; and I am confident that had he carried his investigation farther he would have found the widely creeping and branching rhizome of *N. repens* throwing up fronds at intervals, and forming a more or less extensive bed.

N. longicuspe, Baker, from Madagascar, seems to be *N. repens*, but the rhizome is wanting. The West African specimen cited above is, or was, in the *Nephrodium molle* bundle at Kew. The largest frond of *N. repens* I have is 4 ft. long, including the auricled base, by 10 in. br.; but a specimen in Mr. Gamble's collection, his No. 17824, from Sikkim I think, mounted on three sheets, is 6 ft. l. by 1½ ft. br., 2 ft. of that length being merely auricled, the auricles not papilionate ; the stipe is wanting. The fern is probably rare in Eastern India : Clarke's No. 44652, from Shillong, is perhaps the only representative from Assam. I have seen a few specimens of a plant, with glands at base of pinnæ and papilionate auricles on the stipe, from Sikkim and the Madras Presidency, which have portions of an erect caudex, and these I think ought to be called *N. ochthodes*, Kze. (under *Aspidium*). Beddome's figure in F.S.I., t. 106, seems to be a representative of this last-mentioned plant, and it shows the papilionate auricles, though only two pairs of them. *N. repens* loves moisture, and grows by the sides of water-courses and on swampy ground below springs.

(*To be continued.*)

FISHING IN INDIAN WATERS.

PART III.

ADEN AND THE ADJACENT WATERS.

BY F. O. GADSDEN, R. I. M.

(*Read before the Bombay Natural History Society on 28th June* 1899).

I find that in the course of the preceding articles, I have had so repeatedly to refer to different places, when speaking of certain fish, that I regret now that instead of dealing with individual species of fish I did not devote the chapters to the different places instead of to the different fish. Hence, I propose now instead of calling your attention to a fish to describe to you in detail the sport to be had in and about Aden, and thus I cannot escape linking with the places the sorts of fish that are to be caught about them. In speaking of Aden and its adjacent waters, I shall include Little Aden, Perim, Berbera, and Zeila, the two latter on the African Coast, and a better stretch of water—one with greater possibilities of sport—no man need ever wish to have the run of.

Aden bears a very bad name; but, take my word for it, Aden is a very much maligned place. To passengers who on a Mail steamer are only going to stop for two or three hours, perhaps only to coal, to them, I have no doubt, it appears a ghastly hole; and as it is always more or less hot there, and as these aforesaid passengers are cramped up on the steamer, perhaps even not in the best of tempers, and from the fact that the ship is at anchor miss the cool sea breeze that they have probably got accustomed to, they naturally curse the place, and go away with a very wrong impression.

To the sojourner in the land, Aden is very different. Aden, with its social gaieties; Aden, with its tennis courts; Aden with its cricket and golf links; Aden, with its polo ground; Aden, with its easy chances for the energetic and vigorous to cross over to the African Coast, where they can shoot lion, several sorts of deer, and game of all sorts; Aden, with its thirst-producing capabilities and its delightful and convivial club, where you may do your level best to quench the same, and where you can get a really good rubber of whist every evening; and, above all, Aden, with its magnificent fishing, free to all right under your nose; Aden, I say, in spite of the heat, which its rocks throw off and which has a peculiar grip about it, this Aden is not half such a bad place after all. One thing more while I am about it. The rocks of Aden, and more especially Jebel Shum Shum, in the early morning sunlight as you approach it from the eastward, with the full glow of a glorious eastern sunrise shining on it, is a sight difficult to equal, and not easily forgotten. There is a legend that there used to be one tree growing in the Gold Mohar Valley, but I believe that it has now gone, and on the rocks themselves there is apparently no vegetation; but in the early morning glow the whole hillsides look transformed and as if they were clothed with the most luxuriant growth of glorious heather ; such purple tints as I have never seen elsewhere away from the Upper Highlands of Scotland ; and Shum Shum in the morning rivals Ben-y-glœ at its best. I have casually remarked that there is apparently no vegetation. I am not a botanist, but I believe I am correct in stating that there are about 120 different flora indigenous to this cinder heap, many of them being really remarkable ; as, for instance, the Aden lily, of which two sorts are to be found high up on the mountains only—one a yellow and one a white species (*Alberca yerburghii* and *A. alba*). These are much sought after and appreciated, and in addition there is a great deal of bird and insect life on the high slopes. But this is not fishing in Indian Waters, and it was to that more particularly that I proposed to draw your attention ; but even now, when I come to think of it and to look back on the many hours spent, I am swamped with the floods of old memories and am almost at a loss to know where to begin. I have in a former article referred in detail to the mullet and garfish fishing that is to be obtained there, so that I do not propose to touch on it here again further than that in the list of fish which I shall give. I shall simply mention their names.

Besides these, *viz.*, the mullet and garfish, there are seer fish, bonito, tunnies, albacore, dolphin, horse-mackerel, several sorts of rock cod (grey, green and red) and dozens of other smaller sorts, the best of which belong to the Lutianus and Sciœna families ; while, if you work into the shallower waters near the rocks, fish of most wonderful colours, resembling parrots, jays and macaws, literally gleaming with all the most brilliant colours of the rainbow, are to be had. Fish with green bodies and yellow stripes, fish with heliotrope or lilac bodies and blue fins, with scarlet bodies, with black bodies and blue spots are common ; but one seldom goes out for them unless one wants them for bait, wherewithal to tempt the mighty rock cod as they are perfectly useless for the table, give no sport, and curiously enough, most of these brilliantly-coloured rock fish emit a very disagreeable odour. Their brilliant colours, and I think also their strong smell, are given to them as a means of protection, the former in order to harmonise with their surroundings, which consist of rocks and the brilliant coral growths, and the latter because with the exception of the rock cod, the fishermen all say that nothing else will eat them. The Arab and the Somali fishermen, who will eat almost anything, won't look at them, and I have only once come across a man who would. Years ago I served with an Italian and one day I caught a particularly evil-smelling specimen, with a black leathery skin studded with blue spots, and was going to throw it away when B. reproved me by saying that "God made all things good, and he was going to eat that fish." Eat it he did, too, in spite of an aroma which would have sickened a hog or choked off a Burman, in spite of his being accustomed to his national delicacy of "Ngapee" (rotten fish paste) and which nearly turned us all up; but it did him no harm apparently, for he lived to take, and still lives to draw his pension, but I don't fancy that he liked it; and I do not remember his ever repeating the experiment.

But, though there is most excellent fishing all the year round in nearly every part of the inner harbour, the two great features are the fishing for bonito, seer fish, dolphin, and albacore, which come on about the end of April, and last on to about July or August, and the rock cod fishing, which I have always found to be best during the cold weather months, say from the end of October until the beginning of March. In April, either on account of approaching climatic disturbances, due to the monsoon, or perhaps from some other natural causes connected with their growth, there suddenly appear in the harbour countless millions of small fry of several sorts of fish, from 2 in. to 6 in. in length, and these shoals are followed up and accompanied by troops of large ravenous fish, chiefly of the tunny and seer fish tribes, and all day long these can be seen chasing and breasting in the shoals. On an occasion of this sort, when the shoal is seen to be thus pursued, the thing to do is, to get a boat at once and quietly row off and get into such a position that the shoal shall pass close by and in front of you. Having baited with a small live fish, you wait your chance, and then when the commotion is at its height, pitch lightly into the middle of this arena, and then see all clear for a run. The smaller fry, when pursued thus, seem to dive for a short time, and you will probably help on this manucevre by your presence and by your throw; but your bait will not be able to disappear with equal rapidity, being handicapped by your line, &c., and it will at once attract the attention of some of the larger fish below. The consequence being that a course of action is taken by the larger fish which you highly approve of, which course of action is most likely to lead to your better acquaintance. Hour after hour and day after day have I followed out these tactics, and, I must say, that I have been very fairly successful. The very largest fish I have ever killed on a rod, was hooked and killed in this manner. I had been watching from the ship's deck a shoal quite close by, which was being rapidly thinned out by the vigorous measures taken by what I thought was a couple of large fish. The rod was rapidly put together, and I was waiting for the boat to come round, when just then, under the stern of the ship, appeared a fisherman's canoe with a couple of Arabs in her whom I knew well, and with whom I had been out before. They were after the same game, and same shoal. I waved them over, and got into their boat, and they in a minute or so had planted me beautifully in front of the shoal. A moment more and the two monsters were at their larks again; a heave, and my bait fell right close up to where I had just seen one of them disappear, and the next second a furious plunge, and my line went straight away with the reel simply shrieking.

For two and-a-half mortal hours that fish dragged the boat all over the place. I had hooked him well up in the inner harbour, but he went straight out to sea, took us down past the light-ship, then changing his mind, crossed over towards Little Aden and finally turned sharp round and went back up the harbour.

Never once did he stop for a breather, but went straight on from start to finish, and it was only at last in sheer desperation I butted him severely and got him for a moment alongside the canoe. That moment was enough though for the Arab ; he leaned over, and in another second the steel was entered, he was dragged bodily in board, and *the* fish, so far, of my life was safely landed. Two hours after when weighed he scaled 73 lbs. He was a bonito, a well-shaped fish, not long for his weight, and I remember at the time being struck by his extreme breadth and depth. Furthermore, that day I got three more fish in the same way before knocking off, but none of them were to be compared with my first, all three of them being under 13lb. apiece. On this occasion I was using an 18 ft. 6 in. Salmon rod, 5 in. reel (ship made, by the bye, which I have hardly ever used since that season), 220 yards of Arab-made cotton line, dressed with fish oil, brass wire twisted trace, with single wire end, and a 3/0 Limerick hook ; bait, a young mackerel, about 7 in. in length and 4 oz. in weight. I believe I could have killed my fish much more quickly, but I found myself sadly handicapped in a narrow crank canoe with so long a rod ; and it was chiefly this that determined me not to use a longer than 13 ft. rod for boat work, for at the last, when it comes to gaffing, a long rod is terribly in the way.

Once since that day have I found myself fast in a bigger fish, but on that occasion I got worsted, and the fish got off. In Berbera Harbour, on the African Coast, I was trolling one day, also from an Arab Somali canoe, when I got an offer, struck to it promptly, and very nearly got pulled out of the boat in consequence. The fish went straight away at right angles, causing the boat to heel over, and it took us some time to get straightened and tidied up, and to realize that we were in for something out of the common. I have never fished for tarpon, nor have I ever hooked by accident a Mark II, 18in. torpedo going at thirty knots ; but I don't believe that either of these could have beaten the first rush of that brute. He, like my former friend, took us all over the shop, and at the end of one and-a-half hours he seemed quite as fresh as when he first started, which was a great deal more than I was. I had caught sight of him once or twice, and had discovered that I had hold of a shark, apparently about 8ft. long, and also had made up my mind that I should eventually have to cut myself free, but I was loth to do so until I could do it with the least possible loss .of line. It did not come to that however. In one of his mad rushes he turned round, and, coming to the top of the water shot ahead close to the boat. The Arab in the bows saw him coming, and stood ready with a heavy paddle, and as it went past made a beautiful stroke, and caught the brute fair and square on the back behind the dorsal. The blow doubled him up completely for the moment, and had the boatman then stopped, I firmly believe we could have killed him, or, at any rate have secured him to the boat for the time being and towed him away; but the native got very excited, and recommenced hammering him with the paddle about the head, and in one of his wild strokes came down on the nose of the beast, and the paddle glancing off from the obliquity of the blow, cut my line clean out of the shark's mouth, and I had the mortification of seeing my fish gradually sinking out of sight. However it may have been all for the best. I sometimes doubt now whether we could have killed him alongside, and it would have been a very risky affair to have gaffed and dragged him into the canoe unless and until he was really dead, and even if we had got him we could have done nothing with him; but at the time I felt rather savage at the loss, and I am afraid that, in company with my Arab Somali boatmen, I freely cursed him "for the son of a thousand dead dogs."

Such are some of the more exciting adventures to which one is liable when engaged in this class of fishing; but on the other hand, I have the recollections of many a good day, when fish of medium weight came freely, and when the basket, after four or five hours' fishing, contained, say, five or six fish, ranging from 15lbs. to 20lbs. apiece. It is, as I said, at its height only during the time that the so-called sardines are about.

It is not necessary to go hunting the shoals; take a boat and row or sail quietly about, towing out a long line and stopping occasionally to let your bait roam, and you will, at almost any time of tide, get a run, and my impression is that the prizes were many and the blanks few and far between.

This only lasts on, however, to about August; after that I don't say that you would not get them, but the cream of the season is gone by that time. Later on, in October, you will see the Arab boats foregathering near the rocky patches which lie in the harbour off Ras Marbut, Steamer Point, Ras Tarshein and Ras Marshag, and if you go out to them you will find that all their energies are being devoted to the rock cod. There is a large amount of satisfaction in catching them. They run pretty heavy, and although they do not sport anything like so well as the other fish, still, they generally make one good short, sharp rush, to get back to their own particular haunt I fancy; and then after you have landed them, they, like their prototypes at home, are most excellent eating. The seer fish is fairly good for the table, but the same can hardly be said of the bonito, albacore, and dolphin, or even of the tunnies. They have a very coarse-grained flesh, and are rank in flavour, and rather oily, a fish cake of bonito is like a compressed cake of saw-dust and fish oil. The cod, however, is really good, the red ones especially. They are baited for with live bait deep down, and here it is that one often uses the smaller rock fish for bait; very often you will find the same man fishing with two lines, with the smaller of which he is catching his bait—the same gaudy, coloured rock fish ; and, having caught them, he simply transfers them to his hook, returns them to their native element after having spat on them for luck, utters the well-known prayer " Bismillah " and hopes for the best. These rock cod run very heavy at times, seldom less than 9lbs. or 10lbs., and I have seen them up to 65lbs. and have heard of much heavier fish being taken. One evening, off Ras Tarshein, at the entrance to the inner harbour, not so very long ago between the hours of 3-30 and 7-30 P.M. I got seven fish, all red rock cod, and three of them scaled 132lbs. between them, the other four accounting for only 37½lbs. It is almost a pity to use a good rod at this fishing ; they, after their first run, are so given to sulk and cling to the rocks, and in order to induce them to move you have to put on such a strain, that you are very apt to spoil your rod, or give it a nasty permanent set.

But I love the rod, and as hand-lining is unto me as " the abomination of desolation" so, straining or no straining, I always use the rod, and I always advise others to do so. It is marvellous the strain you can put upon a fish with a good rod. Few fish can stand it long, and when once you move them the line generally shortens in somehow ; of course you will kill more quickly with a hand line.

But I must get on. Up to now I have only dealt with the two classes of fish that form, as I say, the distinctive features of the fishing to be had in and about Aden ; but this class of fishing is *primâ facie* comparatively deep sea fishing. Before closing, I want to deal with another fish, which inhabits much shallower water, and is seldom found in more than two or three fathoms. Off the entrance to Zeila there are several coral reefs, to navigate a ship among which is both difficult and dangerous, and although these reefs are clearly defined, and marked off by buoys, ships of any considerable draft do not generally go in nearer than about two miles from the landing place. Again in Perim Harbour, on the right hand side as you enter and about 80 yards from the pier leading up to the lighthouse and troops' quarters, there are some beautiful patches, and it is to these I wish to direct your steps. On all these coral and sandy patches is found the *Lutianus roseus*, a thick, broad, heavy built fish, with a hump like a camel, and a coat of the most beautiful scarlet hue. At times they congregate in great schools, and when in the humour they bite magnificently. They resemble a perch in many respects, and though they have a thick, leathery skin, they are really first-rate on the table if well-boiled and taken fresh. I have before me as I write the details of two days' sport among the Lutianus, one at Zeila in 1893, when the ships had anchored, and I had pushed off in a small boat, made my way over to the Fairway buoy, secured the boat to the buoy, and commenced operations. Time from 2-20 to 6-30 P.M., single handed, except for two men to work the boat. Basket ninety-seven fish, largest 11lbs., smallest 2lbs. Among these were five grey cod, but all the rest were Lutianus. Another day, Friday (if you please), Sept. 9th, 1887, was as follows. This is taken from the diary of one who was in the boat :—"Arrived at Perim 9 A.M. Went ashore. In the afternoon went fishing with Mac A. and S. and G. Returned after having had grand sport. All a red fish species, 123 in number. One weighed 19 lbs. Many of us were unfortunate in losing hooks and several good fish. Left Perim at 9-15 P.M. for Zeila.—Signed E. C."

This speaks for itself. We were four of us in a large cutter, and when we left off, the centre of the boat was nothing but a heaving mass of fish. The total aggregate weight I know not as it was never weighed. The fish were distributed among the ship's crew, and were most welcome, but I am sure that I am well within the mark when I say that there was close upon 900lbs. of fish. These were taken in some four hours or so by four of us, only one of which used a rod, but I will never admit that the rod was one whit behind the hand lines in the long run, and at any rate it accounted for the heaviest fish. It was a glorious afternoon's sport. Bait to begin with was shrimps and the soft parts of hermit crabs, but long before the end came we had run out of bait, and were cutting up fish to bait with. The gear used was simple ledger with a snood of two hooks. On the rod I used a paternoster, also with two hooks one above another.

And now before closing I would like to refer just once again to baits. Far and away before everything else is the live sardine. Put carefully on the hook, he will live a long time and roam well, and as it is the natural food of the larger voracious fish, no wonder that it takes so well. But it is not always to be had, and next to it I like a Blue Phantom, but they seldom make them large enough, and besides that the triangles with which they are mounted are for the most part worse than useless. A decent sized sea fish will crunch up the average triangle as easily as a girl will eat a meringue, and I have long given up triangles in favour of single hooks. At one time I used a "Sarcelle" arrangement with very fair success, and after all the india rubber bands I could lay my hands upon were used up, we used to carry on with small strips of white cotton tape, tied on loosely enough to enable it to "wobble" in the water. Almost any bright thing will attract the fish when they are about, and it does not require any great ingenuity to dress up a lure.

For bottom fishing you can get shrimp, hermit crab, cuttle fish, or squid and many other sorts of shell fish, and if you are fishing off the steamer's side in the evening, for anything you can get, and can induce the Chief Engineer to give you an electric light over the side, you will find it will be a great help to you in making a bag. It seems to wake up and attract the fish, and often in the evenings after dinner when I have been too lazy to go further afield, I have had it rigged up and the result has been satisfactory. It is, of course, impossible in the course of an article like this to tell you exactly where to go and what to do. Only the general outlines can be laid down. If ever any of your readers find themselves in Aden or the neighbourhood, the best advice I can give them is to place themselves first of all in the hands of some native fishermen, and be guided by them in all things. You will probably not altogether approve of many of the native's ways and his tackle, &c., but until you have gained a bit of experience it is much better to put your pride in your pocket and don't be too proud to learn. If you do this for a very small amount of current coin judiciously expended, you will be taught a lot, and then when you have learnt the different places, &c., where the best fish are to be found, you may, if you like, cut yourself adrift and paddle your own canoe; and I can wish you no better luck than I have on very many occasions enjoyed myself.

THE "LANTANA BUG."

(*Orthezia insignis*, Douglas.)

BY E. ERNEST GREEN, HONORARY ENTOMOLOGIST TO THE GOVERNMENT OF CEYLON.

HISTORY OF THE PEST IN CEYLON.

IT is now more than five years since this insect was first noticed in Ceylon. In January, 1893, specimens were received from the late Dr. Trimen, then Director of the Royal Botanic Gardens, Peradeniya. Dr. Trimen, in forwarding the insects, wrote :—"We are afflicted by an abominable pest now in the Gardens, which I do not recollect to have seen before. It bids fair to be the worst thing of the sort I have had here, and attacks especially *Acanthaceæ*, which includes our showiest shrubs. I never saw any pest here that increased so rapidly ; the Garden is quite disfigured by it." In the following April Dr. Trimen wrote that after cutting down and burning all the affected bushes they had seen nothing of the pest for some time ; but that, at the time of writing, it had re-appeared and was rapidly increasing. The next report from the Gardens was not until September 1894, when the pest was said to be very bad and covering everything. About the same time a very large brood of the male insects suddenly appeared in the Gardens ; and in this same year it was observed that the pest had extended its range outside the Gardens and had established itself firmly upon Lantana in the neighbourhood.

Thinking that the time had now come to warn the planting community of the danger, an illustrated article on the insect was published in the "Tropical Agriculturist" for January, 1895.

Though the pest has been steadily increasing in strength and extending its range, it does not appear to have attracted any general attention or created any alarm until early in the present year, by which time it had spread within a radius of about 20 miles around Kandy. The question then arose as to whether the insect would attack any of our cultivated products. It has since been observed, in one or two localities, upon tea plants growing in the immediate neighbourhood of infested Lantana bushes.

PRESENT RANGE OF THE PEST IN CEYLON.

Though at first confined to the Kandy district, the pest has now spread to other parts. To the north-east it has been recorded from Rangalla. It extends southwards throughout the Gampola and Nawalapitiya districts. An outbreak has been observed in Pundalu-oya. The Director of the Botanic Gardens reports the occurrence of the insect on the Badulla side of the country. No doubt if careful observations were made all over the Island, the pest would be found to have a still wider range.

DISTRIBUTION IN OTHER COUNTRIES.

The original home of *Orthezia insignis* is still rather doubtful. It has been reported from various countries. The insect was first described from specimens collected in the plant houses at the Royal Botanical Gardens, Kew, where it found a congenial home. It must have been received there from some other country. Dr. Morris, late Assistant Director of the Gardens, considered that they owed its introduction to British Guiana. It occurs in the West Indies (Trinidad, Jamaica, and Antigua being specially mentioned) and in various districts of Mexico. In South America it has been recorded from British Guiana. In the United States it has become a common greenhouse pest. Quite recently Mr. C. P. Lounsbury has drawn attention to his appearance in South Africa (Cape Town, Natal, Port Elizabeth, and East London are mentioned as localities), where it is a troublesome pest both in greenhouses and gardens. It is said to have been known in Natal for the last five years ; and specimens—supposed to date back ten years—exist in the South African Museum, labelled " Durban, Natal."

DESCRIPTION OF THE PEST.

As with most scale-insect pests, the resulting injury is more conspicuous than is the insect itself. In the present instance, though most travellers on our railway have observed the unhealthy appearance of the Lantana on the sides of the track,—with its leaves blackened by the sooty fungus that accompanies the pest,—very few of them have any idea of the actual form and appearance of the bug that is responsible for this effect. A closer examination of the diseased bushes would show that all the younger shoots and branches are thickly covered with what they would probably describe as a " mealy bug." This species, however, differs from the ordinary " mealy bug " in the firm—almost shelly—nature of the waxy appendages, and in the fact that a large part of the back of the insect is exposed.

It will be as well to describe first the adult female, as this is the most conspicuous stage and the one in which the *Orthezia* may be most easily recognized. The insect itself is of a dull olive-green or olive-brown colour, with a fringe of short stout opaque-white waxy processes, and a double row of similar projections down the middle of the back. But the most striking feature is the long white cylindrical appendage springing from the extremity of the body. This is the ovisac, and contains the numerous eggs. When fully developed this ovisac is four times as long as the body of the insect. It tapers very slightly, is fluted above and smooth below, and has an upward curve to the extremity, where there is an opening for the exit of the young larvæ. The legs and antennæ of the insect are well developed and project beyond the margins of the body. The mouth parts consist of a conical tubercle springing from between the bases of the first pair of legs, and from its extremity the long hair-like sucking tube can be extended into the tissues of the plant. The length of the insect and ovisac together is very little short of a quarter of an inch.

The half-grown female is in all respects similar in external appearance to the adult insect, except for the absence of the ovisac. It is therefore a much less conspicuous insect, and measures only about one twenty-fourth part of an inch in diameter.

The young larva again does not differ very much from the half-grown insect, except in point of size. It is however of a paler colour, and the marginal fringe is only very slightly developed.

The eggs, which are carried within the ovisac packed in a cottony material, are at first almost white. They soon deepen to yellow, then orange, and, just before the emergence of the larva, become of a greenish tint.

The male insect, after the first moult, is readily distinguishable from the other sex. It becomes more elongate and, instead of secreting compact waxy processes, envelops itself in a loose woolly secretion. Rudimentary wings begin to appear towards the end of this stage. The pupal (or nymphal) stage is only distinguished by the presence of rather longer wing pads, and in the greater length of the antennæ, which are then folded back along the sides of the body, extending nearly to its extremity. The pupa has long, well-developed legs which it can use when disturbed, though it usually remains quiescent beneath its woolly covering.

The adult male is a very graceful little insect, of a totally different appearance to the female. It is of a slatey grey colour, with very long slender antennæ, a single pair of greyish wings, and a tuft of long white silky filaments at the end of the body. The eyes are black and divided into numerous facets. It has no mouth, and consequently takes no food in this stage, having laid in a sufficient store during the larval period.

LIFE HISTORY AND HABITS.

There appears to be a constant succession of broods. I have examined infected plants at all times of the year, and have always found the insects in all stages, from the newly hatched larva to the adult female. I have kept individual females under observation. After the first commencement of the formation of the ovisac a period of three weeks elapses before the emergence of the first larva, after which the young insects hatch out at the rate of about five a day for a period of six weeks or more ; by which time the parent is exhausted and dies, and the earliest hatched larvæ are mature and commence ovipositing on their own account. The length of life of a single insect is therefore about fifteen weeks ; but as it commences to produce larvæ at the ninth week, there may be five generations in the course of the year.

This fecundity is more or less independent of the attentions of the male insects, which appear only at irregular intervals. It is doubtful whether a generation of males is produced even once a year. It is remarkable that the true male of *Orthezia insignis* has been recorded only from Ceylon. Supposed males have been described and figured both in England and America ; but in both these cases the male of a totally different insect has been erroneously associated with this female. Since the appearance of the pest in Ceylon two male broods only have come under my personal observation—in July, 1894, and May, 1898. On both these occasions the male insects occurred in enormous numbers, hovering in the air like gnats, the silky tufts on their tails glistening in the sunlight. In May of the present year (1898) myriads of these little flies might be seen floating in the air in certain parts of "Lady Hortan's Walk" and other roads about Kandy.

It is the female that is responsible for the chief damage, as she continues to pump up sap from the plant during the whole period of her existence. Unlike most scale-bugs, the *Orthezia* is quite an active insect and able to change its position at will. It prefers the young shoots to the older stems, and moves upward with the growth of the plant.

FOOD PLANTS.

Although the *Orthezia* is popularly known in Ceylon as the "Lantana Bug," this is by no means the only plant which it affects. It is more particularly a garden pest, and it was upon the ornamental shrubs and plants in the Peradeniya Gardens that it first attracted attention. Its adoption of the Lantana plant is quite an acquired habit.

It was only noticed that *Orthezia* had a special taste for certain natural orders of plants, *Acanthaceæ*, *Rubiaceæ*, and *Verbanaceæ* being particularly appreciated by the insect. Since its residence with us it has very largely increased its list of food plants. It would be difficult to give a full catalogue but the following plants have been noted :—

Acanthaceæ :—Crossandra, Justicia, Thunbergia, Meyenia, Strobilanthes.

Rubiaceæ:—Cinchona, "Coffee" (Arabian and Liberian), Gardenia, Hamelia, Ixora, and many common weeds.

Verbanaceæ :—Verbena citriodora ("Scented Verbena"), Lantana, Stachytarpheta, Duranta.

Compositæ :—Tithonia ("Wild Sunflower"), Chrysanthemum, Achillea, Vernonia, Ageratum ("Goatweed"), and many common weeds.

Solanaceæ :—Habrothamnus, Capsicum, "Tomato."

Labiatæ :—Coleus, Salvia.

Rutaceæ :—"Orange" and various kinds of Citrus.

Leguminosæ .—Clitoria.

Caprifoliaceæ :—Lonicera ("Honeysuckle").

Bignoniaceæ :—Tecoma.

Rosaceæ :—"Strawberry."

Amaranthaceæ :—Iresine.

Ternstromiaceæ :—"Tea."

Convolvulaceæ :—Ipomea.

Lythraceæ :—Cuphea.

The above names are chiefly those of ornamental shrubs, garden plants, and common weeds. We have, so far, no very serious reports of injury to any of our more important economic plants. It will be noticed that both the tea and the coffee plant figure on the list. Of the latter I have seen abandoned plants in waste land thickly colonized by the bug. Superintendants of coffee estates should be on their guard against the introduction of this pest.

The tea plant fortunately does not appear to be a favourite food of the *Orthezia*, though, failing more favoured plants, it can subsist and breed on our staple product, and the subsequent generations might very readily acquire the taste for Ceylon tea. The danger arises from the enormous and rapid reproductive powers of the insect. When it finds a congenial food plant—such as Lantana—it multiplies till every shoot is thickly tenanted, and the later broods are simply crowded off and compelled to seek fresh pastures. The several instances of the establishment of the pest upon tea have manifestly arisen in this manner.

REMEDIAL MEASURES.

The *Orthezia* is one of, if not the most resistent of all scale-bugs towards insecticides. It is therefore a useful subject upon which to test various treatments. An insecticide that will kill *Orthezia* can be almost guaranteed against any scale pest. It is remarkable that the half-grown insects will often survive treatment that has successfully destroyed the younger and older individuals.

In the case of isolated trees attacked by this pest, the gas treatment is really the most effective and complete. This consists in covering the tree with a tent or sheet of some closely woven material, beneath which hydrocyanic acid gas is generated. The deadly gas will penetrate to every part of the tree and reach every single insect. I have recently ascertained by experiment that an *extra* strength of the gas with a *shorter* exposure (than usually prescribed) is the most certainly fatal to the insects and the least injurious to the plants. The gas treatment however, though really very simple, requires considerable care in application, and is subject to certain dangers. It cannot therefore be recommended for general use without previous demonstration by a trained operator.

Spraying is the next best measure. But however thoroughly this work may be done, a certain proportion of the insects is bound to escape, and the process must be repeated at intervals until the pest has finally disappeared. I have found that mixtures of which soap is the principal component are more efficacious against *Orthezia* than any other form of insecticide. Besides killing the insect, the soapy matter blocks the aperture of the ovisac, and so prevents the emergence of the young larvæ. Kerosine-soap-emulsion is a useful and inexpensive mixture, but requires careful preparation. The formula is :—

Kerosine	2 gallons.
Common Soap	$\frac{1}{2}$ lb.
Water	1 gallon.

Dissolve the soap in water heated to boiling. Add the kerosine to the hot mixture, and churn till it forms a thick cream on cooling. The churning is the most important part of the process. If this is not done thoroughly, the oil separates out on cooling, and will not then mix with water. A properly compounded emulsion may be subsequently diluted to any extent. The churning may be effected either by stirring vigorously with a bunch of twigs, or the liquid may be repeatedly drawn up and expelled through a garden syringe. To test the mixture, put a drop on to a piece of glass. If it adheres without separating into oil globules, the process is complete. For application, dilute with nine or ten times the bulk of water. Kerosine emulsion should not be applied during sunshine, or serious injury to the plants may result.

Strawson's "Red Spider Insecticide" and McDougall's "Insecticide Wash" are very convenient forms of soap mixtures, and are both very effective against *Orthezia* in the proportion of 1½lb. of the mixture to 4 gallons of water.

The insects will remain attached to the plant for a long time (sometimes two or three weeks) after they are dead. An examination with a hand lens is necessary to determine whether the application has been successful or not. If the legs remain rigid and do not move when the insect is disturbed, it may be presumed to be dead.

After spraying it will be advisable—where possible—to prune the bush and burn the prunings.

Where the pest has become widely distributed,—as on Lantana in waste land,—any treatment of the above nature will be quite impracticable. In such a case all we can do is to endeavour to keep it in check by periodically cutting back and burning the Lantana and other weeds that lodge the insect. In districts where *Orthezia* is prevalent all boundaries should be kept carefully cleared back. If Lantana is allowed to encroach upon the tea, the latter is bound to become affected sooner or later.

NATURAL ENEMIES.

Natural enemies may possibly exist in the native country of *Orthezia insignis.* But, so far, the career of the pest in Ceylon has been unchecked by any such causes. Birds do not feed upon it, and I have not found a single insect parasite—external or internal—preying upon it. I have tried to induce various species of lady-birds to eat this insect, but they have one and all absolutely refused—preferring to die of starvation.

A writer in the "Kew Bulletin" (June-July, 1895) quotes from the "Timehri" (a Demerara Journal) in which Mr. R. Ward gives some account of the habits of the *Orthezia* (in Demerara ?). He says : "Although common, it is not nearly so destructive or troublesome as many of its allies. In the young state it is very abundant ; after it becomes fully developed it is more easily preyed upon by its natural enemies, which play an important part in limiting its ravages. In this respect no insects are more assiduous than the grubs of the different species of *Coccinella* (lady-birds), *Syrphus*, the various *Hemerobidæ*, of which the different species of *Chrysopa* act a chief part." It would be interesting to know if Mr. Ward is speaking of his personal observation of the natural enemies of the *Orthezia*, or whether he is alluding in general terms to the acknowledged work of such natural enemies.

MODE OF DISTRIBUTION.

The young larvæ of all scale-insects are very easily transported from one place to another. They are minute and active, and can exist for several days without food. They may crawl on to the feet of birds, or even on to larger insects that may be resting on the bug-infested plant, and may be conveyed in this manner to a considerable distance before being dislodged. They may be brushed off the plant and carried away on the clothing of passers by.

The rough cumblies used by Tamil coolies are particularly liable to carry the infection. Wandering cattle are also unconscious distributors of the pest. The young insects are so light that they may be transported by wind. The conspicuous way in which the pest is spreading along the sides of the railway track points to the supposition that they are carried along by the draught of passing trains. Running water is another fertile source of distribution. An infested plant growing on the banks of a stream or river is sure to shed some of the insect into the water. Individuals may be floated down for miles before effecting a landing.

The interchange of garden plants is also a great source of danger. It was in this way that the pest obtained a footing in Ceylon.

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(1) Journal of the Quekett Microscopical Club, Ser. II., Vol. III., No. 20 (Dec., 1887), p. 169 *etseq.*; 2 plates. "Notes on a Species of *Orthezia* found in Kew Gardens," by Edward T. Browne.

(2) Entomologists' Monthly Magazine (Jan., 1888), p. 169, with several figures (A Description of the species, by Mr. J. W. Douglas).

(3) Thirty-Second Annual Report of the Massachusetts Agricultural College, for 1894. "A New Greenhouse Pest," by C. P. Lounsbury.

(In the three papers quoted above, the male of a species of *Dactylopius* is erroneously described and figured as that of *O. insignis*).

(4) Annual Report on the Royal Botanic Gardens, Peradeniya, for 1893, by Dr. H. Trimen. (Mention of injury by the pest.)

(5) Indian Museum Notes, Vol. III., No. III. (1894), p. 103. "A New Coccid from Ceylon," by G. B. Buckton, F.R.S. (*O. nacrea* is here a synonym of *O. insignis*).

(6) Tropical Agriculturist (Jan., 1895), p. 437 : 1 plate. " An Important Insect Enemy," by Mr. E. E. Green, F.E.S. (Giving a description of the pest and its ravages in Ceylon.) [Afterwards reprinted in pamphlet form.]

(7) Timehri, Vol. III., New Series (1889), p. 308, with figures. (Reference to the occurrence of the insect at Kew, by Mr. S. J. McIntyre).

(8) Timehri, Vol. IV. (1890), p. 304. (An account of the Habits of the *Orthezia*, by Mr. R. Ward).

(9) Kew Bulletin (June-July, 1895), p. 162. (Reference to the pest at Kew and elsewhere).

(10) Entomologists' Monthly Magazine (June, 1895), p. 137. " On the Male of *Orthezia insignis*," by Mr. J. W. Douglas, F.E.S.

(11) Annals and Magazine of Natural History, Vol. XVI. (July, 1895). " On some Coccidæ obtained by Mr. C. A. Barber in the Island of Antigua, W. I.," by Professor T. D. A. Cockerell.

(12) Bulletin of the United States Department of Agriculture, Division of Entomology. Technical Series No. 4 (1896), pp. 10, 21, 23. " On some Mexican and Japanese Injurious Insects," by Professor T. D. A. Cockerell.

(13) Insect Life, Vol. V. (1892-93) : Page 89, " *Orthezia insignis* as a Garden Pest," by Professor T. D. A. Cockerell ; page 121, " Notes on Plant Faunæ," by Professor T. D. A. Cockerell ; pages 159, 247, " Food Plants of some Jamaican Coccidæ," by Professor T. D. A. Cockerell.

(14) Bulletin of the Cape of Good Hope Department of Agriculture, Nos. 6 and 12 (1898). " Another introduced Scale Pest," by C. P. Lounsbury. (Reprinted from Agricultural Journal, March 31 and June 23, 1898.)

(*Reprinted from the circular of the Royal Botanic Gardens, Ceylon, Series I, No.* 10.)

THE BIRDS OF THE ANDAMAN AND NICOBAR ISLANDS.

By A. L. Butler, F.Z.S.,

Curator, Selangor State Museum.

(*Continued from page* 403.)

Part II.

680. **Merula obscura**, Gemel. Oates, II, p. 134 ; "Str. Feath.," II, p. 223.

I only came across this thrush once, a female which I shot on May 14th. It was feeding on the dead leaves under a bamboo by the roadside and flew up into a tree with a squeak very much like that of a redwing, which, from its size and colour and conspicuous superciliary streak, it very much reminded me of.

Mr. Hume did not meet with it, and includes it in his list on the strength of a specimen received by Blyth. Mr. Oates says it is "a winter visitor, more or less abundant to the whole of Burma, the Andamans, Manipur, Shillong, Sikkim and Nepal." In the Andamans it is decidedly rare.

684. **Geocichla sibirica**, Pall. Oates, II, p. 138 ; "Str. Feath.," II, p. 223.

Has only been recorded from the Andamans once, Mr. Blyth having received a specimen from Port Blair in 1860.

688. **Geocichla albigularis**, Blyth. Oates, II, p. 142 ; "Str. Feath.," p. 221.

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NOTICE.

This plate of Moths, with the explanations of the figures, should face page 292 when this volume is bound up.

Editor.

somer species of the two. Car Nicobarese name, "chook-chyong."

(6) Tropical Agriculturist (Jan., 1895), p. 437 : 1 plate. "An Important Insect Enemy," by Mr. E. E. Green, F.E.S. (Giving a description of the pest and its ravages in Ceylon.) [Afterwards reprinted in pamphlet form.]

(7) Timehri, Vol. III., New Series (1889), p. 308, with figures. (Reference to the occurrence of the insect at Kew, by Mr. S. J. McIntyre).

(8) Timehri, Vol. IV. (1890), p. 304. (An account of the Habits of the *Orthezia*, by Mr. R. Ward).

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(11) Annals and Magazine of Natural History, Vol. XVI. (July, 1895). "On some Coccidæ obtained by Mr. C. A. Barber in the Island of Antigua, W. I.," by Professor T. D. A. Cockerell.

(12) Bulletin of the United States Department of Agriculture, Division of Entomology. Technical Series No. 4 (1896), pp. 10, 21, 23. "On some Mexican and Japanese Injurious Insects," by Professor T. D. A. Cockerell.

(13) Insect Life, Vol. V. (1892-93) : Page 89, "*Orthezia insignis* as a Garden Pest," by Professor T. D. A. Cockerell ; page 121, "Notes on Plant Faunæ," by Professor T. D. A. Cockerell ; pages 159, 247, "Food Plants of some Jamaican Coccidæ," by Professor T. D. A. Cockerell.

(14) Bulletin of the Cape of Good Hope Department of Agriculture, Nos. 6 and 12 (1898). "Another introduced Scale Pest," by C. P. Lounsbury. (Reprinted from Agricultural Journal, March 31 and June 23, 1898.)

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THE BIRDS OF THE ANDAMAN AND NICOBAR ISLANDS.

By A. L. Butler, f.z.s.,

Curator, Selangor State Museum.

(*Continued from page* 403.)

Part II.

680. Merula obscura, Gemel. Oates, II, p. 134 ; "Str. Feath.," II, p. 223.

I only came across this thrush once, a female which I shot on May 14th. It was feeding on the dead leaves under a bamboo by the roadside and flew up into a tree with a squeak very much like that of a redwing, which, from its size and colour and conspicuous superciliary streak, it very much reminded me of.

Mr. Hume did not meet with it, and includes it in his list on the strength of a specimen received by Blyth. Mr. Oates says it is "a winter visitor, more or less abundant to the whole of Burma, the Andamans, Manipur, Shillong, Sikkim and Nepal." In the Andamans it is decidedly rare.

684. Geocichla sibirica, Pall. Oates, II, p. 138 ; "Str. Feath.," II, p. 223.

Has only been recorded from the Andamans once, Mr. Blyth having received a specimen from Port Blair in 1860.

688. Geocichla albigularis, Blyth. Oates, II, p. 142 ; "Str. Feath.," p. 221.

Fairly common throughout the Nicobars, but shy and difficult to procure. One or two usually frequent the heaps of old cocoanut husks and other refuse thrown into the jungle edge near every Nicobarese village. Mr. Oates mentions as one of the differences between this bird and *Citrina* that "the under tail coverts are much tipped and otherwise marked with greenish or slaty brown" ; this difference does not, I think, hold good ; one adult bird I killed (out of four only) having the under tail coverts pure white with only the faintest greyish tips on two of the feathers. Mr. Oates says the colour of the bill, &c., have not been recorded. My notes are :—*Bill*, black, lower mandible horny grey at base; *iris*, brown ; *legs* and *feet*, dark brownish fleshy.

The nest and eggs are similar to those of the next species. I obtained one egg, but it was unfortunately broken.

In the young bird the two cheek-stripes are dark and blackish brown and very conspicuous. In freshly killed specimens the crown of the head is a particularly rich reddish chestnut, quite different from the dull brown tinged orange chestnut in *Andamanensis*, making the Nicobar bird by far the handsomer species of the two. Car Nicobarese name, "chook-chyong."

689. GEOCICHLA ANDAMANENSIS, Wald. Oates, II, p. 142; "Str. Feath.," II pp. 221 and 495.

This handsome ground thrush is fairly common near Port Blair. It is most often met with feeding among dead leaves on the ground in jungle. When approached quietly it does not fly, but works away from the intruder with long bounding hops and soon vanishes in the undergrowth. If startled suddenly it dashes up with a loud flutter and pitches again a short distance further on; if flushed two or three times it probably takes refuge in a thick tree. It does not, however, by any means confine itself to forest and is often seen on roads, manure-heaps, &c., far from any jungle. It is then tame and easy to shoot, often flying up into a tree by the roadside and allowing one to approach it within a few feet. It often goes in small parties; I have counted as many as seven feeding together, and all looked like old males, which I think collect together more or less when the hens are engaged in the duties of incubation.

They very often breed, if not in a colony, at least in very close proximity. On May 16th I found the following nests, all within 100 yards of each other, in a young clearing of padonk saplings:—

(1) Nest 15 feet from ground on bamboo boughs bending down horizontally; one fresh egg.

(2) 8 feet from ground in fork of padonk sapling; two young.

(3) Ditto.

(4) 10 feet from ground; 3 eggs.

(5) 5 feet from ground in a soft, fleshy-stemmed plant; one broken fresh egg.

(6 and 7) Apparently new nests in padonk sapling, but in which the birds never laid.

(8) 8 feet from ground in a teak sapling; 2 fresh eggs. This last nest was about 200 yards away from the others.

There seemed to be no other nests anywhere near the spot, though there was a lot of similar cover.

I have another note of three nests within about twenty yards of each other.

Besides these I found many single nests, mostly with young, some of them in small trees in the open at some distance from jungle.

The nests are composed of a foundation of dead and skeleton leaves mixed with a good deal of earth or mud and a lining of roots and black hair-like fibres. They are as a rule fairly conspicuous at twenty yards; much easier to find than the bird is to shoot. The bird is very shy when nesting; slipping away off eggs or young before you are near the nest, and not putting in an appearance again as long as you are in the neighbourhood. When you catch a fledged young bird, however, their natural shyness is forgotten in their distress and both parents flutter round and round you within a few feet until their offspring is restored to them. The fledgling is olive grey above the head, neck and back streaked with buff, most broadly on the neck ; the two stripes below the eye almost black and very distinct ; upper breast with the buff feathers edged with olivaceous ; remaining lower parts buff.

I shot one specimen with the legs and feet dark brown ; they are as a rule pale whitish flesh colour.

692. PETROPHILA SOLITARIA, Mull. Oates, II, p. 145 ; "Str. Feath.," II, p. 220.

A rare winter visitant to the Andamans. The Novara Expedition killed a single bird on Car Nicobar in February.

729. UROLONCHA SEMISTRIATA, Hume. Oates, II, p. 186 ; "Str. Feath.," II, p. 257.

The common munia of the Nicobars. I saw very young birds in August.

730. UROLONCHA FUMIGATA, Wald. Oates, II, p. 186, "Str. Feath.," II, 257.

Very common in the Andamans.

776. PASSER DOMESTICUS, Linn. Oates, II, p. 236.

The Andamans have no longer the distinction of being one of the few places where this ubiquitous bird is not. In 1882 Mr. O. H. Brookes of the Settlement turned out about half a dozen on Ross, where they hung about for some time and then disappeared, apparently going over to the main land. In 1895 Mr. Brookes imported about 20 more, which he let go at Middle Point Barracks, Aberdeen, where there is now a thriving colony of them. They have also bred at Gara Cherama.

791. EMBERIZA PUSILLA, Pall. Oates, II, p. 254 ; "Str. Feath.," II, p. 497.

A rare winter migrant to the Andamans.

797. EMBERIZA AUREOLA, Pall. Oates, II, p. 259 ; "Str. Feath.," II, p. 258.

Has been obtained in the Nicobars in winter.

813. HIRUNDO RUSTICA, Linn. Oates, II, p. 277 ; "Str. Feath.," II, p. 154.

The swallow is common in the Andamans and Nicobars from September to May, young birds being far more numerous than adults. It does not breed in the islands.

817. HIRUNDO JAVANICA, Sparrm. Oates, II, p. 279 ; "Str. Feath.," II, p. 155.

A common resident in the Andamans, breeding in verandahs and outhouses. It has not been recorded from the Nicobars, but I believe a swallow which I saw on Car Nicobar in August was this species. A pied variety at Port Blair will be found described in this Journal, Vol. XI, p. 736.

827. MOTACILLA LEUCOPSIS, Gould. Oates, II, p. 288 ; "Str. Feath.," II, p. 237.

A winter migrant to the Andamans, apparently rare.

832. MOTACILLA MELANOPE, Pall. Oates, II, p. 293; "Str. Feath.," II, p. 237.

The Grey wagtail must be a far more common winter visitant to the island than it was in 1873. Davison notes that he only saw it six times in the Andamans and once in the Nicobars. It is now quite a common bird during the winter months remaining in the island from September to March.

833. MOTACILLA BOREALIS, Sundev. Oates, II, p. 294; "Str. Feath.," II, p. 237.

A regular winter migrant to both groups, not uncommon, but far outnumbered by the next species, from which it is hard to distinguish it unless very close. Arrives in the islands with *flava* in October.

834. MOTACILLA FLAVA, Linn. Oates, II, p. 295; "Str. Feath.," II, p. 238.

Extremely plentiful in paddy fields, grass land, &c., in both groups from October to late in May.

839. LIMONIDROMUS INDICUS, Gmel. Oates, II, p. 300; "Str. Feath.," II, p. 239.

The tame and prettily marked little wood wagtail is a winter visitor to the island, not uncommon, but far from numerous. I met with it half a dozen times only, always singly on forest-bordered roads or on the muddy tracks made by elephants dragging timber through jungle. It frequents the same spot day after day.

845. ANTHUS RICHARDI, Vieill. Oates, II, p. 307; "Str. Feath.," II, p. 239.

Davison found Richard's pipit common in the Andamans in April. I did not come across it, but I was not in the islands during that month. I did not see a pipit of any sort in the islands.

849. ANTHUS CERVINUS, Pall. Oates, II, p. 310; "Str. Feath.," II, p. 239.

Anthus cervinus is a winter visitant to both groups, apparently not uncommon. Mr. Oates says *A. rufulus* has not been recorded from these islands, but "probably occurs."

885. ÆTHOPYGA NICOBARICA, Hume. Oates, II, p. 350; "Str. Feath.," I, p. 412.

This honey-sucker is, I think, confined to the central and southern groups of the Nicobars. Of Car Nicobar Mr. Hume notes, "two of our party said they saw our new honey-sucker," but I do not think it occurs on that island which I worked most thoroughly. A mistake may have been made, as some of Mr. Hume's party were "not practised observers."

897. ARACHNECHTHRA PECTORALIS, Horsf. Oates, II, p. 361; "Str. Feath.," II, p. 196.

The Malay yellow-breasted sun-bird is very plentiful in the Nicobars. Mr. Oates says "there are two distinct races of this bird in the Nicobar Islands. Those found in Car. Nicobar, Bompoka, Trinkat, Camosta and

Katchal have the culmen short as in birds from the Malay Peninsula and islands ; those found in Condul have the bill extremely long, the culmen measuring about ·85."

I take it this race inhabits all the islands of the southern group—the great and little Nicobars, Pilu Milu, &c.

Car Nicobarese: " roycha."

899. ARACHNECHTHRA ANDAMANICA, Hume. Oates, II, p. 363 ; " Str. Feath.," I, p. 404.

Common in the Andamans ; very partial to the flowers of the cocoanut palm and to those of the Shoe Flower (Hibiscus).

I took one nest with 2 fresh eggs at Gopla Kabung on May 30th. It was suspended over the surface of a stream, about 3ft. above the water which was eight or nine feet deep, so that I had to swim out and tread water while taking the nest. This was very similar to a nest of *Asiatica* composed of fibres, flakes of bark, bits of dead leaves, seed heads of fine grass, spider's webs, &c. The actual nest itself was about 4 in. by 3 in., but with a suspending store above and a trailing adornment of dead leaves, &c., below, it measured 12 in. altogether. The portico projected one inch. The eggs are very different to those of *Asiatica*; dull white, sprinkled sparingly at the small end and plentifully at the larger with little lines, dots, and blots of dark blackish brown, under which are a few faint marblings of pale greyish brown. Many of the dark marks have the appearance of having been made with a pen on a wet surface and having " run" slightly. The male of this nest was not in full plumage, having the breast only speckled with metallic feathers. Mr. Oates mentions a nest taken in March and I shot a breeding bird on January 20th and July 7th.

918. DICÆUM VIRESCENS, Hume. Oates, II, p. 380; " Str. Feather." II, p. 198.

This flower-pecker seemed to me remarkably scarce in the Andamans, to which it is peculiar. Mr. Hume in his notes on the Birds of the Islands of the Bay of Bengal ("Str. Feath.," II., p. 198) mentions receiving four specimens, but he did not notice it himself and says that Davison, though he saw it at Port Monat, failed to procure an example. I only saw the bird once, near Port Blair; it settled on a trailing spray of *Thunbergia* within three or four feet of me, but as I backed away to shoot it, darted off through the jungle and disappeared.

931. PITTA CYANOPTERA, Temm. (?) Oates, II, p. 392 ; " Str. Feath.," II, pp. 75, 225

Mr. Hume saw a Pitta which he took to be this species on the Great Nicobars. It may as he suggests possibly have been a new species.

971. DENDROCOPUS ANDAMANENSIS, Blyth. Blanf., III, p. 42; " Str Feath.," II, p. 187.

This small Wood-pecker is fairly common near Port Blair ; it is usually met with singly or in pairs. Like many small Wood-peckers, it is more partial to the branches of trees than the trunks. I have two or three times noticed it clinging motionless to the extreme top of some tall dead stump in jungle, looking out over the tree tops, and occasionally, giving a rattle on the wood, apparently as a call note or mere amusement.

1000. THRIPONEX HODGEI, Blyth. Blanf., III, p. 75 ; "Str. Feath.," II, p. 189.

This fine black wood-pecker is fairly common in the Andamans, but rather shy, and from the thickness of the jungles not easy to shoot. Each individual has two or three favourite dead stumps, to which it repairs two or three times daily, and clinging motionless to this look out post for half an hour at a time, it gives out at intervals a most extraordinarily loud jarring rattle on the dead wood, which can be heard for a mile or more, and is usually answered from two or three other parts of the forest.

I once flushed this bird from the ground. It seems always to be more or less ragged and moulting, and I did not succeed in getting a really good specimen.

1025. EURYSTOMUS ORIENTALIS, Linn. Blanf., III, p. 107 " Str. Feath.," II, p. 164.

The broad-billed roller occurs in the Andamans but does not extend to the Nicobars. Davison notes it as " comparatively common about Mount Harriet and other well-wooded places." The bird seems to be scarcer now ; I only saw it some seven or eight times altogether, and to anyone acquainted with it it is a conspicuous bird at any distance. The flight of this bird is very graceful. I have seen it follow a flight of termites to a great elevation, hawking in wide circles, taking a few slow strokes with its wings and then sailing on outspread pinions for a considerable distance. It brings the wing very far down in flight, so much so that the tips appear to point straight downwards at the end of a stroke.

This is a very difficult bird to procure in the Andamans. Many of the tallest trees have their topmost branches bared and dead, blasted by the force of some of the terrific cyclones to which the islands are subject. On these dead topmost branches the roller rests motionless watching for its prey. You proceed to stalk him and, after forcing your way to the base of the tree through a horrible undergrowth of rattan, pandanus and other detestable prickly abominations, you see—if indeed you can see *anything* through the dense thicket in which you are standing—the roller in the same position somewhere between 90 and 120 feet over your head. Now this roller is, like other rollers, extremely tough and tenacious of life, and at this great height the shot you have taken so much trouble to obtain usually resulted in *Eurystomus* flying lazily off to a perch a quarter of a mile further into the forest, leaving a very ruffled and exasperated naturalist to work his way through the thorns into the open again.

1027. MEROPS PHILIPPINUS, Linn. Blanf., III, p. 111 ; "Str. Feath.," II, p. 162.

The blue-tailed bee-eater is common in the Nicobars, where it may be seen hawking over the grassy track almost everywhere. It is replaced in the Andamans by the next species.

1030. MELITTOPHAGUS SWINHOII, Hume. Blanf., III, p. 114 ; "Str. Feath.," II, p. 163.

Fairly common in the Andamans, where it is a permanent resident breeding in May. In the hot weather they keep nearly always to the vicinity of streams, over which they capture an insect or two with gliding easy flight and then return to rest often with their bills agape on some convenient bamboo or plaintain leaf.

I shot one bird in December feeding on the ground on a sandy bank to which it was clinging. Seeing it in this position I naturally thought it was choosing a site for a nest hole, but as I noticed it kept picking something from the bank. I promptly shot it, and found to my surprise that it was feeding on some small blackish beetles which were running about sunning themselves on the sand. This must have been an individual eccentricity as numerous others of the species were around it, all capturing their prey in the usual bee-eater fashion.

1035. ALCEDO ISPIDA, Linn. Blanf., III, p. 122 ; "Str. Feath.," II, p. 173.

Occurs in both groups. I generally saw it on salt or brackish creeks fringed with mangroves. Mr. Davison said it was not so common in the Andamans as the next species, on which Mr. Hume remarks "*my* experience is that at the Andamans it is decidedly more common than *Asiatica*." *My* experience, again, was the same as Davison's ; for every *ispida* I saw I must have seen at least three of *beavani.*

1036. ALCEDO BEAVANI, Wald. Blanf., III., p. 124 ; "Str. Feath.," II, p. 174.

Fairly common in the Andamans. I generally came across it on small *fresh* water streams, but Mr. Davison notes "keeps exclusively (as far as I have observed) to the salt water creeks."

To get a series of this bird in the Andamans entails a good deal of wading, as most of the streams it frequents are so thickly edged with jungle that walking along the banks is quite impossible. While wading thus up these narrow streams I have several times seen one of these king-fishers flitting down stream towards me ; in such cases they generally held on their course, darting past me within a few feet in preference to turning.

1040. CEYX TRIDACTYLA, Pall. Blanf., III, p. 127 ; "Str. Feath.," II, p. 173.

Scarce in the Andamans. I got one beautiful little specimen which had flown into a tea factory near Port Blair, but though I searched the most likely little streams and backwaters in the jungle .I never saw another. Mr. Blanford says it also occurs in the Nicobars.

Mr. Hume's party did not meet with it; Mr. Davison only saw one during his stay in the islands, which too, had flown into a building.

1042. PELARGOPSIS LEUCOCEPHALA, Gm. Blanf., III, p. 129; "Str. Feath.," II, p. 166.

Occurs on the southern islands of the Nicobar group, frequenting the seashore and tidal creeks. Mr. Hume says that even where it does occur it is rare, and appears to be excessively wary and difficult to procure. Mr. Blanford considers Nicobar and Borneo birds identical.

1043. PELARGOPSIS GUARIAL, Pearson. Blanf., III, p. 129; "Str. Feath.," II, p. 165.

Not uncommon on the mangrove bordered tidal creeks of the Andaman but wild and hard to shoot. It does not appear to occur in the Nicobars.

1044. HALCYON SMYRNENSIS, Linn. Blanf., III, p. 132; "Str. Feath.," II, p. 167.

This Kingfisher is excessively common in the Andamans. It would hardly be exaggerating to say that anywhere in the open, one is seldom out of sight of two or three, while one can often count seven or eight in sight at once. I have sometimes seen it hover over water for some seconds, like *Ceryle rudis*, and then dart obliquely into the water and catch a fish.

Being so numerous it often happens that when one leaves his perch to pick up a crab or an insect, he finds it occupied on his return by another, who evidently coveted his neighbour's post of observation and took the first opportunity to obtain it. The new comer receives the rightful owner with threatening open bill and a harsh note of defiance, and, being hampered by the mouthful he wants to swallow the original occupant of the coveted stump always gives way, the usurper remaining in possession.

1045. HALCYON PILEATA, Bodd. Blanf., III, p. 133; "Str. Feath.," II, p. 168.

The beautiful Black-capped Purple Kingfisher occurs, though very rare in the Andamans and Nicobars and on Narcondam. I did not meet with a single specimen.

1046. CALLIALCYON LILACINA, Swains. Blanf., III, p. 134; "Str. Feath.", II, p. 169.

Less rare perhaps than the last, but very uncommon. I did not come across this Kingfisher either. Mr. Hume says that it affects the gloom of the mangrove swamps.

1047. SAUROPATIS CHLORIS, Bodd. Blanf., III, p. 135; "Str. Feath.," II, p. 170.

Extremely common along the seashore and up the tidal creeks in the Andamans. Mr. Blanford says the nests are said to be made under a stone or bush, but Davison found one at Mergui in a deserted ants' nest occupied by hornets—a pile of hard clay against a tree trunk. Wardlaw Ramsay saw a pair going in and out of a hole in a tree at Mount Harriet and thought they had young in the hole.

1048. SAUROPATIS OCCIPITATIS, Blyth. Blanf., III, p. 137 ; "Str. Feath.," II, p. 171.

Extremely common throughout the Nicobars, where it is one of the first birds met with on landing on the snow-white coral beach. Habits similar to those of the last species. Davison found them nesting in clay ants' nests built against trunks of trees, but only succeeded in obtaining a single egg from a shot bird which measured 1·16 × ·98. Car Nicobarese: "sukkar."

1056. RHYTIDOCEROS NARCONDAMI, Hume. Blanf., III, p. 149 ; "Str. Feath.," I, p. 411. Finn. Jour. A. S. B. Vol. LXVI., p. 523.

Peculiar to the island of Narcondam, a steep jungle covered hill rising abruptly from the deep sea about 80 miles East of the North Andaman. I tried hard to get myself landed on Narcondam by the mail steamer 'Shahjehan,' which passes close to the island on the Rangoon run, and repasses two days later. Owing to the difficulty of landing on the island the Company objected to this plan, pointing out that if the sea were rough on the return of the ship either she would have to lie off till the sea moderated—possibly entailing an infringement of the mail contract—or the company would be held responsible for leaving me on an uninhabited island without water. Mr. Blanford says it is only known from the pair obtained by Mr. Hume in 1873. There are three or four specimens in the Indian Museum, Calcutta, lately presented by Colonel Temple.*

1069. CYPSELUS APUS, Linn. Blanf., III, p. 165 ; "Str. Feath.," II, p. 156.

A single specimen was killed at Port Blair on July 30th, 1873.

1074. CYPSELUS SUBFURCATUS, Blyth. Blanf., III, p. 168.

On the 24th July I watched for ten minutes a small white-rumped Swift hawking round one of the bungalows on Ross Island in company with a number of *Collocalias.* It passed me several times within a few yards. I took it at the time for *affinis,* but from the distribution of the two species it was more probably *subfurcatus.*

1078. CHÆTURA INDICA, Hume. Blanf., III, p. 173 ; "Str. Feath." II, p. 155.

Common at Port Blair throughout the year, though sometimes one does not notice it for a week or two together. Scores of these splendid Swifts used to assemble every evening round a bungalow on Mount Harriet in which I lived for some time and I never tired of watching their marvellous flight. Marvellous it always is, but round this particular hill top they seemed to love to put forth their full powers. Bird after bird would rush past one, within a few feet, with a sound like the twang of a struck harp string; with rigid motionless wings and only a slight rocking or swaying motion of the body they would glide at lightning speed down the mountain side and ten seconds later be lost to sight far away over the water of the magnificent harbour lying below.

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*I have since heard that some more specimens were obtained this year by the officers of the R. I. M. S. "Elphinstone."

I note that Mr. Daker says "legs and feet pale fleshy pink"; in all the Andaman birds I examined, fifteen or so—they were either livid purple or brownish purple, as also they are, I find, in Malayan examples.

Some of these Swifts are infested with a large flat tick, nearly $\frac{1}{3}$ of an inch in length: from one bird I took over thirty which were clinging in rows to the bases of the stiff tail feathers under the lower tail coverts; there were no others on the bird and it struck me that the parasites possibly took up this position to be as much as possible protected from the rush of air during the hours when the bird was on the wing.

Where the Spine-tails, which hawk over Port Blair in the evenings till dusk, roost or breed, it is difficult to conjecture. Birds shot in February, May, and June, showed no signs of breeding.

When winged this Swift utters a shrill squealing cry. Only one of my birds had the spot in front of the eye white, in the others it was mouse colour.

1083. COLLOCALIA INNOMINATA, Hume. Blanf., III, p. 177; "Str. Feath.," II, p. 160.

Occurs in the Andamans, but must be scarce. Mr. Hume's party only obtained one example during their visit in 1873.

1084. COLLOCALIA FRANCICA, Gmel. Blanf., III, p. 178; "Str. Feath.," II, p. 160.

Very common in the Andamans, breeding in various caves on the coasts. It also occurs more rarely in the Nicobars, though Mr. Hume says he did not see it at all there. I did not see any in the Nicobars either, though *linchi* was simply swarming.

1085. COLLOCALIA LINCHI, Horsf. and M. Blanf., III, p. 178; "Str. Feath.," II, p. 157.

This tiny little Swiftlet is extremely abundant in both groups, breeding in caves along the coast and also at Port Blair nesting freely in occupied barracks, buildings, etc. The nests are composed of moss glued together with brownish white saliva.

Davison has given a capital account of their actions when building ("Str. Feath.," II, p. 159).

They have one rather curious trick which I have not seen noticed. Often when one bird is clinging to the commencement of a nest its mate flutters round unable to find a foothold. In this case the sitting bird catches the other by the tips of the primaries and holds him suspended thus for some little time. In a cluster of these birds at work building, I have sometimes seen three or four at the same time hanging downwards in this way, their mates holding them by the tips of their outspread wings.

When at roost they cling together like a swarm of bees.

They breed at least twice a year. Mr. Hume found them breeding in March; they were breeding in the Nicobars during my stay in August and September, and in Port Blair in December and January.

Car Nicobarese : "tulikoop."

1094. CAPRIMALGUS ANDAMANICUS, Hume. Blanf., III, p. 190; "Str. Feath.," II, p. 162.

This Nightjar seemed to me very scarce in the Andamans. The first time I saw it was in May, when a bird rose from some dead leaves at my feet in thick jungle and disappeared among the trees before I could fire. I did not come across it again till January, then I found a few at Bamboo Flat, Port Blair, and shot a couple of males. The note is a liquid monosyllabic 'clook! clook! clook!' The bird is not so noisy as most Nightjars. It keeps almost entirely to jungle, being in habits very like *C. macrurus* (*atripennis*). I have seen it perch transversely on slender twigs in jungle. Eggs were obtained by Davison in April. Mr. E. M. Buchanan of the Forest Department told me he once found, but did not take, two eggs in March. My birds shot in January were not breeding.

1096. LYNCORNIS CERVINICEPS, Gould. Blanf., III, p. 192; "Str. Feath.," p. 162.

Mr. Hume thinks that a large Nightjar seen by several of his party on the Southern Jolly Boy in March 1873 may have belonged to this species. The claim of a *Lyncornis* to a place in the Andaman list seems to be very doubtful. *Batrachostomus auritus* seems to me as likely to occur in the islands and far more likely to escape observation than a *Lyncornis*.

1104. CUCULUS CANORUS, Linn. Blanf., III, p. 205; "Str. Feath.," IV, p. 288.

Hume received a specimen of this Cuckoo from the Andamans killed on October 16th, 1876.

1105. CUCULUS SATURATUS, Hodgs. Blanf., III, p. 207; "Str. Feath.," II, p. 190.

Not uncommon in both groups during the summer months. Davison says that he first met with it on March 14th. He remarks that the bird is much more often heard than seen—like so many other Indian cuckoos.

1107. CUCULUS MICROPTERUS, Gould. Blanf., III, p. 210; "Str. Feath.," II, p. 191.

What I took to be this cuckoo, judging by its call—a loud musical whistle of four syllables—was extremely common in the Andamans during the summer months, being especially noisy in June and July, when its melodious notes are ringing through the forests all day, and when there is any moon throughout the night as well. Mr. Hume says that Lord Walden somewhat doubtfully identified four cuckoos shot in January as this species.

Nothing seems known as to what birds are chosen as foster mothers in the Andamans by the cuckoos which breed there.

1115. CHRYSOCOCCYX XANTHORHYCHUS, Horsf. Blanf., III, p. 221 ; "Str. Feath.," p. 191.

The lovely Violet Cuckoo occurs in both groups, but is apparently very rare. I never saw the bird, though I was particularly anxious to obtain it and kept a keen look out for the species. Apparently it breeds in the islands.

1116. CHRYSOCOCCYX MACULATUS, Gmel. Blanf., III, p. 222.

The same remarks apply to this species.

1120. EUDYNAMIS HONORATA, Linn. Blanf., III, p. 228 ; "Str. Feath.," II, p. 192.

Common both in the Andamans and Nicobars. It is difficult to guess what nest they lay in in the Nicobars, whence the few imported crows have apparently quite disappeared. The Nicobars, by the way, did not approve of the crows at all, black and ominous the cute old corbie seemed to the superstitious islanders a truly fearsome fowl, an evil spirit whose presence must certainly devastate their villages with fever, if it brought no more terrible disaster, in its train.

1130. CENTROPUS EURYCERCUS, Hay. Blanf., III., p. 239 ; "Str. Feath. II, p. 196.

Mr. Hume's party saw a large jungle crow of the *rufipennis* type on Condul in the Nicobars and at Macpherson's Straits. In Mr. Hume's opinion, the birds, which were not obtained, belonged to this species. Blanford says he considers *eurycercus* to be distinct from *sinensis,* with which Shelley unites it. It *seems* to me possible that this bird will be found to be a not uncommon species in the Great Nicobar, as it is in Sumatra, the former island being still almost untouched by ornithologists.

1132. CENTROPUS ANDAMANENSIS, Tytler. Blanf., III, p. 242; "Str. Feath.," II, p. 194.

This brown-bodied jungle crow is a common bird throughout the Andamans, occurring also on the Cocos. Its habits and voice are exactly the same as those of the Indian bird, though I have heard it when startled utter a curious chuckle unlike any sound made by *sinensis.*

The Andaman Coucal is rather partial to frogs and crabs, in search of which it may be seen walking about on the mud of newly ploughed paddy-fields or the ooze of the mangrove swamps.

Frogs are killed by a few violent pecks on the head. I was once rather amused at seeing one of these birds suddenly drop a frog it had killed and was about to swallow, to pounce on a second which it had caught sight of. Having duly caught, executed and eaten No. 2 it proceeded to swallow No. 1. The frogs are bolted whole.

It is difficult to get really fine skins of this species; the broad tail feathers are almost always in a more or less ragged condition. I caught one of these jungle crows by hand which had moulted nearly all its primaries at the same time and was quite incapable of flight. A number used to get caught in the snares (unbaited) which I set on the ground in jungle for the Red Rails (*Canningi*); when handled they fought fiercely, pecking extremely hard and uttering a most crow-like cawing. At these times they erect the whole of the plumage of the head and face to a remarkable extent, their beautiful red eyes gleaming like rubies under the ruffled bristly feathers. The iris is usually of a shade between scarlet and crimson; Mr. Hume mentions an example in which they were buffy white.

A pair of eggs taken by Captain Wimberley in June from a tolerably high tree in secondary jungle, are described as "broad ovals, very obtuse at both ends; in color a dull much-soiled white with very little gloss, and measuring 1·32 × 1·12, and 1·33 × 1·1." (Hume.)

1137. Palæornis magnirostris, Ball. Blanf., III, p. 249; "Str. Feath.," II, p. 176.

Plentiful in the Andamans and Cocos. The habits in no way differ from those of its allies. The bill of this parrot is simply enormous.

1145. Palæornis fasciatus (Müll.) Blanf., III, p. 256; "Str. Feath.," II, p. 180.

Common in the neighbourhood of Port Blair: from Davison's remarks it appears to be scarce in the other parts of the groups, the cultivation round the settlement probably making that part of the islands its head-quarters.

1146. Palæornis caniceps, Blyth. Blanf., III, p. 258; "Str. Feath.," II, p. 178.

This fine large parrot apparently only occurs in the southern groups of the Nicobars, as Mr. Hume only met with them on Condal Montschall and the Great Nicobar. According to Davison it frequents the highest trees has a peculiar long screeching note, and is very partial to the ripe fruit of the pandanus. Nothing else is known of its habits.

1147. Palæornis erythrogenys, Blyth. Blanf., III, p. 258; "Str. Feath.," II, p. 181.

The Nicobar Red-cheeked Paroquet is extremely plentiful throughout the islands of that group. Davison found them breeding in February and March.

Car Nicobarese: "talaka" or "talahi."

1148. Palæornis tytleri, Hume. Blanf., III, p. 259; "Str. Feath.," II, p. 184.

Occurs throughout the Andamans, including Barren Island, Narcondam, the Cocos, and Preparis. In the Andamans it seemed to me by far the commonest parrot occurring there; in December, I saw it in vast flocks of thousands about the fields of ripe paddy, which it would utterly destroy except for the watch kept by the convict cultivators. I was told most positively by one of the officers of the settlement that he once saw an *entirely light blue* bird among a large flock of this species. Both he and his wife watched this bird for a considerable time while an orderly was despatched. for a gun, before the arrival of which the *rara avis* and its companions had departed to fresh fields and pastures new.

1150. LORICULUS VERNALIS, Sparrm. Blanf., III, p. 261 ; "Str. Feath.," II, p. 185 ; Butler, Journ. "Bom. N. H. S., XI. p. 736."

The little Loriquet is very common in the Andamans, but according to Blanford, 'has not been observed in the Nicobars.' I see, however, that Mr. Hume notes ("Str. Feath.," ii, p. 186)—"on the northern shores of the Great Nicobar, Mr. Wood-Mason saw and watched, but failed to secure, a *Loriculus* which may have belonged to this species or to the Malayan *galgulus*."

I have seen them caught by a bird-limed twig loosely fitted into a hole in the end of a long tapering bamboo, which is gradually pushed up among the foliage in which the love-bird is feeding until the limed twig touches the bird's wing, to which it instantly adheres, sticking the primaries together and preventing its escape. This method of capture requires considerable dexterity ; unless there is plenty of leaf on the tree the bird sees the stick and when there was any foliage I invariably managed to stick the twig gracefully to a leaf half-way between myself and the Lorikeet !

Davison found a nest at Port Blair on the 19th of April. Apparently this species does not line its nest hole ; the Ceylon bird, *Loriculus indicus does*, the only two or three nests I have seen being lined with a thick pad of green leaves and halves of leaves. I have since found and described in this journal a nest which was lined with leaves.

1152. STRIX FLAMMEA, Linn. Blanf., III, p. 264 ; "Str. Feath." III, p. 390.

Very scarce in the Andamans, the specimens which have been obtained being mostly captured in buildings. I heard of one which had for months been living in the roof of a bungalow on the small island of Viper in Port Blair harbour, sallying out regularly every evening at dusk.

Mr. Blanford says "*Strix deroepstorffi* is founded on a very small tawny specimen from the Andaman Islands, with the wing only 9·8, the face suffused with ferruginous, and even the spots on the back dark tawny instead of white. No other skin of this race has been obtained, but all the points of difference are repeated in other insular races of *S. flammea.* There are, however, two skins of this Andaman race in the Indian Museum, where I lately examined them. The race is a very well marked one, but all races of *Strix flammea* are now included under the one species.

Since writing the above I have been fortunate in shooting a fine specimen of this rare race. Measurements.—Length 13½, wing 10⅛, tail 4$\frac{1}{16}$, tarsus 2¼, bill, gape to tip of upper mandible 1¾, expanse 36 inches. I also heard another on several occasions, and after many attempts got a long snap shot at it at night, which had no effect—or rather not the *desired* effect—what it did do was to turn out the guard at the neighbouring police barrack!

The note is the usual Barn-Owl screech: and, from numerous pellets which I found below a hollow tree where I shot my specimen, the food consists entirely of rats and mice.

Mr. Finn kindly gives me the wing measurements of the two birds in the Calcutta Museum as about 9·4 and 9·6. He adds "both have the rufous facial disk and tawny spots on the upper surface, and look much like the Barn-Owl from the Cape Verde Islands (variety *insularis*) figured by Sharpe, Brit. Mus. Cat., Vol. II, Striges, plate XIV, *a* (the left hand figure).

1162. SYRNIUM SP? SELOPUTO, Horsf. Blanf., III, p. 278; 'Str. Feath.,' II, p. 150.

Mr. Blanford says "the reported occurrence of this Owl (*seloputo*) in the Nicobar Islands is probably due to error." Mr. Hume held the same view, not admitting the bird into his list.

A *syrnium* of sorts most certainly occurs in the Andamans: I have myself heard, seen, and *horrible dictu*, missed it! I did my utmost to get a specimen, but failed.

The first time I met with it was one night in June. There was only faint moonlight and a little mist about rendered this even dimmer. From about fifty yards within the black shadow of dark forest an owl was hooting repeatedly, the note being a regular *Syrnium's* "to-whoo!" I could not work my way into the jungle in the dark, so as a forlorn hope I imitated the "to-whoo!" to the best of my ability, the rather startling result being that the shadow form of a large owl swooped almost into my face a few seconds later, and then shied off in the dim moonlight. I fired a snap shot at the disappearing shadow, and thinking I was 'on' him listened intently for the 'thud' of his fall. Alas, there was none.

The next day I searched the whole neighbourhood on the chance of finding the owl in some tree. Failing in this I cleared away the undergrowth near where he had been hooting, so that in the event of his being in the same spot next night I could at least work my way to the place. The owl obligingly fell in with this arrangement, and at dark commenced to hoot away vigorously. I first tried to decoy him again, but he was not to be 'had' twice. I then worked my way gradually into the jungle, which was dark as pitch, until I was right under the bird, in fact he could not have been more than twenty feet immediately over my head. The hoot heard at this short distance was of three syllables, the first being a loud snoring croak, inaudible at a distance. In exactly the same manner the note of *Syrnium indrani* is a two-syllabled hoot heard at a hundred yards, and yet consists really of *four* notes. Well, I waited and waited and nothing could I see, so adopting a plan by which I once killed a *Ninox obscura*, I waited for the next hoot, flung up the gun and *fired at the sound*. The result was a shower of leaves and twigs—only !

For several nights the owl continued to hoot near the same spot, but though I took infinite trouble to get a shot at him I never succeeded. I also heard this same hoot on another occasion, at a place about two miles off. I called the attention of Mr. Buchanan of the Forest Department to this call and he at once said he had seen the bird—a large round shaped owl over a foot high. I have gone rather fully into my unsuccessful attempts to get this bird, partly to show the trouble and difficulty a collector has in securing a a particularly desired specimen, and partly, as I think, the bird may possibly turn out to be a new species of *Syrnium* peculiar to the islands.

1166. Ketupa sp? javanensis? Less. Blanf., III, p. 283.

I am inclined to think the list of Andaman owls is not at all complete. I was repeatedly told of a large owl with horns, frequenting the desolate mangrove swamps bordering many of the salt-water creeks. The bird was seen and shot at by others two or three times during my stay. This would most probably be *Ketupa javanensis.*

1173. Scops giu, Scop. Blanf., III, p. 291 ; " Str. Feath.," II, p. 151.

A dark rufous form of this owl occurs in the Nicobars. (*S. nicobaricus*, Hume.)

Blanford unites the little *Scops minutus* of Ceylon with *giu*, remarking that it is the most distinctly marked of the different races of the bird. The note of *Scops giu* is, according to Blanford, a "peculiar monotonous monosyllabic hoot" now the ordinary note of *Scops minutus* of Ceylon is exactly the same as that of *Scops balli* of the Andamans—a jerked out ' hoot-coorroo !' with ' r ' very distinctly toned. This is the only note I have heard it utter, but Bligh noted a monosyllabic hoot. It is not easy to identify a small and scarce owl with its note in thick jungle at night at all, and when owls go and hoot in two distinct ways to add to the difficulty they ought to be abolished.

In the cases of two races of the same bird hooting in a totally different style (as with *Ninox scutulata*, and *N. affinis*, I have often wondered—the question being quite beyond my knowledge of the subject—whether the difference in voice results from any structural difference in the larynx, which would I suppose establish the races as distinct species.

1176. Scops balli, Hume. Blanf., III, p. 296 ; " Str. Feath.," II, p. 151.

Very common in the Andamans, but from its nocturnal habits and small size is very difficult to procure. Its note resembles the syllables " hoot ! hoot-coorroo ! " jerked out very rapidly, the rolling " r" in the last note being very distinct. This, by the way, is exactly the same note as that of the Ceylonese *Scops minutus*, which Mr. Blanford unites with *Scops giu*. It has also a low clucking note. The Andamanese Scops owl seems to feed to a considerable extent on caterpillars ; in searching for these it sidles up and down the boughs of small trees in a very parrot-like manner. It is rather given to coming into bungalows, two of my specimens being captured in this manner. A female shot in May had apparently just incubated.

1187. Ninox affinis, Tytler. Blanf., III, p. 309 ; "Str. Feath.," II, p 152.

Common in the Andamans ; I am inclined to think less so in the Nicobars where during my short visit I did not hear it.

I have headed this note *affinis,* as I consider this a good species. Mr. Blanford unites it with the continental bird *scutulata* treating it merely as an insular race, but he writes me that he is open to conviction as to its distinctness. I am well acquainted with *N. scutulata* of which I have shot numbers in Ceylon, and *affinis* seems to me an entirely different bird. Besides being a mere pigmy in comparison with *scutulata* it is far more rufous below and has an absolutely different note. The call of *N. scutulata* is a soft, flute-like 'coowhoop' or 'whoo-wuk,' while the hoot of *affinis* is a sharp, quick little sound like "kraw!" or "krow," reminding me of the note of *Glaucidium castanonotum* more than any other owl that I can remember. I twice shot the bird uttering this note, which may be heard every evening among the chorus of *N. obscura* and *Scops balli* with which the forests resound at dusk *affinis* seems to be a shier bird than *obscura* ; it feeds chiefly on moths and beetles.

N. obscura, curiously enough, as the birds are so different in plumage, has exactly the same note as *scutulata* proper.

(*To be continued.*)

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MISCELLANEOUS NOTES.

No. I.—BIRDS FLYING AGAINST WINDOW-PANES.

Is the Purple Honeysucker (*Cinnyris asiatica*) a pugnacious bird? I have frequently seen the male in February and March, when in breeding plumage, fly furiously at a window, against which he keeps himself suspended in the air by a rapid motion of the wings, and pecks repeatedly with his beak against the glass. The easiest explanation appears to be that he is attacking his own reflection. I have, however, never noticed the males of this species fighting, as the males of so many species do at the commencement of the breeding season: possibly they do fight, though I do not happen to have seen them. Perhaps some readers of the Journal can suggest some other reason for the bird's flying against the window as above described. I have noticed it fully a dozen times, and not only at Deesa but also when I was stationed in Cutch. The only other birds I have seen act in a similar manner, were the common Madras Bulbul (*Pycnonotus hæmorrhous*) and common Sparrow (*Passer domesticus*), but both these birds seemed to recognise their mistake much sooner than the Purple Honeysucker.

C. G. NURSE, Capt.,
13th Bombay Infantry.

Deesa, 16*th February*, 1899.

No. II.—FOOD OF THE INDIAN GREY SHRIKE.

What is the limit of the voracity of the Indian Grey Shrike (*Lanius lahtora*)? I was once driving along a road when I saw a bird of this species drop down rapidly from a branch on which he was sitting, much in the same manner as the Pied Kingfisher (*Ceryle rudis*) drops into the water when catching a fish. I was curious to see what his prey had been, and was much astonished to find it was a young squirrel, fully three parts grown, still warm and quivering. The beak of the bird had penetrated the back of the skull.

C. G. NURSE, Capt.,
13th Bombay Infantry.

Deesa, 17*th February*, 1899.

No. III.—ON "INDIAN DUCKS AND THEIR ALLIES."

1. Nukhta (*Sarcidiornis melanonotus*).—I have seen these birds often in flocks in the cold weather, both in the N.-W. P. and in the Panch Mahals, but they appear to keep their pairs even in the flocks, for when one has been shot and the flock has flown away I have observed one remain behind flying round and round searching for its mate.

2. White-winged Wood-Duck (*A scutulatus*).—I once shot a duck in the Bilaspur district of the C. P., which from the plate in Hume's "Game Birds of India" appeared to be this species. It was on a tank situated only a few miles from forest-covered hills.

3. Cotton Teal (*Nettapus coromandelianus*). This is said to be rare in the western part of the empire, but I have found it in fair numbers in the Dohad district, Panch Mahals.

4. Sheldrake (*Tadorna cornuta*). I have seen this bird once in Central India, on a tank about 40 miles south of Neemuch, in the cold weather of 1891-92. Two were walking about on the shore at the edge of the tank, which is a very large one, and one was on the water. I was unable to get a shot, but I examined the birds carefully with a field glass, and I do not think there can be any mistake. I could distinguish a large duck, about the size of a Brahminy, with a bright red bill and face (they were looking towards me), colours chiefly black or dark brown and white, the bird standing much more like a goose than an ordinary duck. The red knob at the base of the bill would account for the appearance of the face.

E. H. YOUNG.

RUTLAM, 21*st February*, 1899.

No. IV.—THE COURTING DANCE OF THE MOONAL PHEASANT.

When shooting in the Himalayas this April I noticed early one morning, while sitting behind a tree, a pair of Moonal pheasants feeding a short distance from me, on a flat terrace on the open hill side. They were so close that I was able to see their every movement distinctly. After being busily engaged some time in their usual digging operations, the hen bird stopped work, and uttered her call note several times, upon which the cock, who was at the time some little distance away, ran up to her with his wings raised high above the back, tail spread, and neck and body feathers distended. He then moved quickly to and fro for a few seconds in front of the hen who stood quietly looking on at his performance ; he then abruptly closed his wings and tail, turned about and ran back to his feeding ground while the hen went on with her breakfast. As the early morning sun was shining on the birds, the sudden appearance of the cock in the above performance, was most splendid to look upon ; the beautiful metallic hues of the wings and throat, with the pure white of the back and chestnut coloured tail, spread like a fan behind, shone out most gorgeously. But it is not for the mere pleasure given by the exhibition, that I write this note, but to direct attention to the unusual behaviour shown by the hen. As I believe in all courting displays among birds of fine coloured plumage the hen takes a most passive part, and does not in any way call the performance up ; but the male birds themselves of their own accord go through the ceremony of showing off their fine feathers in front of their lady loves. But in this case the lady love, by her calls, appeared to have directly invited or encouraged the display, as the lover was digging out his breakfast until he heard the call sounded. While on the subject of Moonal pheasants, I should much like to ask any of the members of the Society, who may have had opportunities of seeing many cock Moonals, whether they have noticed any distinct difference in the colours of the plumage, as according to a recently published book on "Game Birds" compiled by Mr. Ogilvie Grant, of the British Museum, there is described and figured a Moonal pheasant, found in Chamba, which in colouring differs from the ordinary Moonal so much that it is named as a distinct species. So far only three or four skins of this particular bird have been obtained in Chamba, and the appearance of the female is at present not known. Mr. Grant asks sportsmen, who may be shooting in Chamba, to try and obtain a specimen of the female bird if possible. I have for some time made numerous enquiries from villagers and shikaries in Chamba, as well as from the Prime Minister of the State, who is a very keen and observant sportsman, about this particular Moonal, and have so far ascertained that its appearance is generally known, but every one declares that it is only a chance variety of the common cock Moonal, which has been hatched out in a nest of eggs by the common hen Moonal. Consequently there cannot be any special hen bird belonging to the so-called separate species. The cock birds would appear to have a tendency to vary at times, and the Mian Saheb Bhurie Singh, the Prime Minister, told me of a white cock Moonal being observed by his Shikari a short time ago. For the benefit of those who have not a copy of Mr. Grant's "Game Birds" I add a description from it, showing the differences between the so-called Chamba Moonal and the common kind.

Common Moonal pheasant. Lower back pure white, under parts black with no green gloss except on throat ; tail light rufous chestnut.

Chamba Moonal pheasant. Lower back golden green, shading into purplish blue ; under parts entirely glossed with metallic golden green ; tail chestnut tipped with golden green.

G. S. RODON,
Major.

Chamba State, N.-W. Himalayas, *April*, 1899.

No. V.—GAME IN THE WALTAIR DISTRICT.

It may be of some interest to record the result of a season's duck shooting in this district, so far as I have been able to record it. The bag is not a large one, as it represents the result of promiscuous shooting by four district officers, but it gives a good idea of the distribution of duck here. We have been anxious to shoot several varieties not mentioned in the list, such as the Pink-head, the White-eye, Mallard and others said to have been recorded from the Northern Circars, but although pains have been taken to identify the species during the last two years, I cannot record their occurrence, and they must be rare stragglers. The Pin-tail has migrated here in fewer numbers than usual, although they are reported as common in Ganjam, the neighbouring district. A curious fact is that the Gadwall, noted as an excellent bird for the table, has been usually very poor eating and frequently nasty. I can offer no explanation for this, as last year they were as usual one of the best. I have not included the Cotton or Whistling-Teal in the list.

While on the subject of shooting I would report the occurrence of the lesser Florican or Likh and the Wood-Snipe. The former I saw shot at Razan, and the latter I shot myself on the Palhonda Hills. I have not heard of their occurrence here before, although I have known the former shot in the Godavari district.

STEPHEN COX,
District Forest Officer.

WALTAIR, *13th March*, 1899.

LIST OF DUCKS REFERRED TO.

Pin-tail (*Dafila acuta*)	15
Grey duck (*Anas pœcilorhyncha*)	57
Red-crested pochard (*Netta rufina*)	223
Tufted pochard (*Nyroca fuligula*)	35
Common pochard (*Nyroca ferina*)	26
Gadwall (*Chaulelasmus streperus*)	260
Wigeon (*Mareca penelope*)	25
Common Teal (*Nettium crecca*)	53
Garganey (*Querquedula circia*)	54
Others, including Comb-duck, Shovellers and Brahminy ducks...	27
Total ..	775

No. VI.—THE BREEDING OF MOTHS.

With reference to Major R. H. Rattray's note on page 219 of this Volume I think it is very probable that the explanation of the hatching of the eggs of an unimpregnated moth is that moths, like female (or queen) bees, are capable of laying fertile *male-producing* eggs only when they have been completely isolated. Even an ordinary worker or imperfect female bee will sometimes lay eggs, but these eggs, like those of the virgin queen, produce nothing but drones.

If Major Rattray reared a few moths from the caterpillars, he will be able to verify this.

W. V. WALLACE,
Burma Commission.

TOUNGOO, *5th May*, 1899.

No. VII.—BIRDS TAPPING AT WINDOW-PANES.

With reference to Mr. Green's interesting note on this subject (on page 415 of this volume), we have had two very persistent "tappers" in our house at Bankipore. Last year a female Honey-sucker (*Arachnechthra asiatica*) used to hover against the office window, tapping with her beak and flapping with her wings. This year, for months, an ordinary crow has presented himself at a small window at 4 A.M. every morning, cawing and pecking alternately, and this has been repeated at intervals during the day. In neither case could we discover any reason for the birds acting in this curious manner. On several occasions we have tried to shoot this crow and so lengthen our morning slumber, but he is very wary and so far we have failed to kill him. I once caught the Honey-sucker in my hand when she had succeeded in getting inside her favourite window, but I noticed nothing peculiar about her beak.

MARY W. BOURDILLON.

DARJEELING, *9th May*, 1899.

No. VIII.—HYBERNATION OF BLACK AND BROWN BEARS.

With reference to my article on this subject, which appeared in our Journal on page 218 of this volume, I beg to add the following account I received from a very reliable source a few days ago, clearly proving that the brown bear (*Ursus arctus*) does hybernate. The man in question has a lot to do with forest life, both during winter and summer, so may be considered a pretty good authority.

He informed me that he found a brown bear last March, in the hollow trunk of a tosh tree in the Koti. The forest is about three miles from the Rotung Pass, in Kulu, at an elevation of about 11,000 feet. The country was a couple of feet under snow, but he could not find any foot-prints to show that the bear had been in or out of the tree of late, so presumably it had spent the winter there. A little later he came upon a black bear which had been killed by the fall of the tree in which it must have been asleep. It was in very poor condition, but it possessed a magnificent coat.

On the 19th of April this year while out after bara-sing in Kashmir I came upon the perfectly fresh tracks of a brown bear in the snow and which came out of an enormous hollow tosh tree. There were plenty of dry leaves inside the hollow and every indication of a bear having made its home there, but I could see no sign or foot-print showing that it had only lately come into the tree, so my natural conclusion was that it had spent the winter there.

As for black bears (*U. torquatus*) I believe it entirly depends on where the winter finds them. Those that have gone up to higher altitudes after the Indian corn crops have been cut and are caught there by the December snows hybernate, while those that are able to make their way down to the oak forests, at about 3 or 4,000 feet above the sea-level do not hybernate, as I have seen and shot black bears below Mussoorie in January and February.

C. H. DONALD.

BHADARWAR, KASHMIR STATE, *May*, 1899.

No. IX.—OCCURRENCE OF THE NEPAUL KALIJ PHEASANT IN KASHMIR.

I have much pleasure in reporting the appearance of the Nepaul Kalij (*Gennœus leucomelanus*) in Kashmir. In the "Fauna of British India," Birds, Vol. IV, page 91, the distribution of this species is given as from the Western limits of Nepaul to the Arun River. I found and shot one cock in the Kashmir State on the banks of the Chenab River, elevation about 3,000 feet. Unfortunately the skin was damaged by my fox-terrier, but I had no difficulty in identifying it. Its total length was just below 23 inches, wing 8 inches, tarsus 2·5″. The crest was shorter than the ordinary Kalij (*G. albicristatus*), being only 3·4″, whereas the crest of the common Kalij is often as much as 4·2″. It was shot on the 18th of January last and was in company with a covey of the common Kalij.

C. H. DONALD.

DHARAMSALA, *May*, 1899.

No. X.—ABNORMAL NUMBER OF EGGS IN A NEST OF THE BENGAL GREEN PIGEON (*C. PHÆNICOPTERUS, LATH.*).

Two is of course the usual complement of eggs of this species, but I find on looking up a list of nests taken in 1896 that on the 7th of May I got a nest containing *three* fresh eggs. The nest was situated in the fork of a young jack tree (*A. integrifolia*), and the eggs were taken *in my presence.* I could not have been mistaken as to the owner of the eggs, for the bird sat very close allowing the boy to reach the nest before it flew off. This was the only nest on that tree ; had there been others I should have noticed them as the tree was quite a small one. The tail of the green pigeon was noticeable from below, projecting over the side of the nest. To-day I took another nest containing a *single* incubated egg.

C. M. INGLIS.

NARHAR, MADHUBANI, TIRHUT, 10*th May*, 1899.

No. XI.—NOTE ON THE HIMALAYAN VIPER (*ANCISTRODON HIMALAYANUS*).

The interesting article by Capt. Wall, I.M.S., on the above snake published on page 411 of this Volume induces me to mention a peculiarity that may or may not be recorded elsewhere, *viz.*, the power of flattening its whole body as the cobra flattens its hood. The habit is by no means universal, probably for the reason that vipers are generally killed first and tried afterwards, and the killing takes place in circumstances that do not lead to the display of this accomplishment. My last but one victim of this species was the first that I particularly noted as showing anything special in this line. He was coiled up in a hollow under the curving bole of a tree, and seemed quite happy. It seemed a pity to disturb so pretty and little dangerous a creature, but venom is venom, so down I went on my knees and gave him a dab with the end of a stick by way of inviting him to come out and fight. Instead of doing so, or trying to escape, he flattened out his body from head to tail, not so much as a cobra's hood, because there were organs below the vertebral column which caused it to project, but still in a very striking manner. The object seemed to be to get a firmer hold of the ground by extending and flattening the ventral surface, and the faculty would often be useful in steep places.

F. GLEADOW.

CHAKRATA, *May*, 1899.

No. XII.—GECKO CANNIBALISM.

A few days ago, on opening the stomach of a young female gecko (*Gecko monarchus*, a species which occurs fairly commonly in the compound outside our bungalow here), it was found to contain, in addition to a caterpillar and some other remains which I could not identify, a smaller gecko of the same species ; this, judging from its position in the stomach, had evidently been eaten head foremost, and was quite entire.

The lengths of the two individuals were :

Larger individual	Tip of snout to cloaca, 57 mm. (tail broken off).
Smaller ditto .	Tip of snout to cloaca, 32 mm. Tip of snout to tip of tail, 74 mm.

Günther, in his "Reptiles of British India," alludes to geckos as being known to destroy "the younger and weaker members of their own species," and he describes the individuals of *Gecko monarchus* as "pugnacious among themselves" ; but the fact that an animal will prey upon another of its own species while living under completely natural conditions and with an abundant supply of its normal insect food, seems worth recording.

F. P. BEDFORD.

SINGAPORE, *March*, 1899.

(The above appeared in *Nature*.)

No. XIII.—A BIRD KILLED BY A MANTIS.

I send you in spirits a specimen of the Small Sunbird (*Arachnechthra minima*) and a large Praying-Mantis ♀ (probably *Hierodula bipapilla*). The history attached to them is as follows :—

The sunbird happened to come hovering round a branch on which the mantis was, and the mantis, whether in fright or otherwise, struck out at the bird with his forelegs and scalped it, and the bird dropped dead. The mantis was secured alive and both it and the bird were sent to me by Mr. T. J. McCloughin in whose compound the occurrence happened and from whom I obtained an account of it. This was nearly two years ago, and at that time we were both living in Dharwar. Considering the way in which the mantis' forelegs are armed, and that it weighs considerably more than the bird, there is nothing inherently improbable in what occurred.

C. A. R. BROWNE, MAJOR, R.E.

BOMBAY, *May*, 1899.

No. XIV.—THE PALM SWIFT.

I noticed specimens of the Palm Swift (*Tachornis batassiensis*) that were circling round on the evening of the 13th instant, copulating in the air, so that these Swifts behave in the same manner as the English Swift which Gilbert White of Selbourne observed engendering during flight.

F. WALL, CAPTAIN, I.M.S.

RANGOON, 16*th May* 1899.

No. XV.—OCCURRENCE OF THE RUFOUS-BELLIED NILTAVA (*NILTAVA SUNDARA*) AT MURREE.

In the "Fauna of British India" (Birds), Vol. II, the distribution of No. 594, *Niltava sundara*, the Rufous-bellied Niltava, is given as the Himalayas, from Simla to Assam, but I have found it breeding here in Murree. It is fairly common, but only in one place and in dense jungle at about 6,000 feet. I found one nest with 4 fresh eggs on the 20th instant, and shot the female off the nest and also saw another nest about 150 yards up the same nullah, ready for eggs. I also shot a male near the nest from which I took the eggs so as to be sure of its identification. It did not belong to the nest but the female did. Major C. L. Wilson, R.A., was with me and helped to identify the bird.

R. H. RATTRAY, MAJOR,
22nd Punjab Infantry.

MURREE, 25*th May* 1899.

No. XVI.—THE RED-TAILED CHAT (*SAXICOLA CHRYSOPYGIA*).

A CORRECTION.

With reference to my note on page 225 of this Volume, regarding the Red-tailed Chat, and to my list on page 330, in which I included it as occurring at Thull, I should like to explain that I shot a number of birds and after a long search in Oates and Blanford, came to the conclusion that they were *Saxicola chrysopygia*. I sent one specimen to Mr. Cardew of Ootacamund, mentioning my doubts as to its correct identification. He agreed with me, but as he could find no other bird it could be, he came to the same conclusion as I had done. I subsequently sent one of the birds to Mr. J. Davidson who being unable to identify it sent it to Mr. Bowdler Sharpe of the British Museum who identified it as No. 359, *Aedon familiaris*, the Grey-backed Warbler. Mr. Oates remarks that it is not likely to be found breeding in any part of the Empire, but it was so commonly at Thull.

R. H. RATTRAY, Major,
22nd Punjab Infantry.

Murree, 25*th May*, 1899.

No. XVII.—BIRDS TAPPING AT WINDOW PANES.

I have read Mr. Ernest Green's letter in the Miscellaneous Notes, page 415, of this Volume with much interest. A couple of years ago a brother of mine had the same experience with a magpie. The bird used to come regularly every morning after sunrise, perch on the window-sill and peck industriously at the glass, if " shoo'd " away it returned after a brief interval and began tapping again until frightened off. It became such a nuisance to a man who disapproved of early rising that it was destroyed after turning my brother out of bed about 5 o'clock every morning for a fortnight. The house where this occurred stands alone amid a surrounding of forest trees on the shores of Lough Sheelin, Co. Cavan.

E. D. CUMING.

20, Pembroke Road,
London, 10*th May*, 1899.

No. XVIII.—TRAWLING IN INDIAN WATERS.

The Investigator's Successful Cruise.

After a careful inspection of the *personnel* and detention ashore of those few of the crew who were at all feverish, the R.I.M.S. *Investigator* put to Sea from Bombay, on October 10th, on her seven months' surveying cruise. The programme for the season comprised for the first three to four months the survey of Moulmein River from its mouth to the town of Moulmein as well as the approaches to the river, and for the remainder of the season the Western Coast of the northern part of the Andaman Islands. As the *Investigator* was obliged to take in coal and some other necessaries in Colombo, and as the Ceylon quarantine authorities have ordained that no ship be given free entry into their ports within ten days of departure from Bombay, this necessary period of probation was most usefully and successfully employed in deep sea trawling off the West coast of India and Ceylon at varying depths of from 40 to 1,000 fathoms. When the bottom of the sea is suitable for trawling—sand or mud—the method adopted on the *Investigator* is very simple. The trawl for dragging along the bottom and capturing the dwellers thereon consists of a stout iron frame work, to which is attached a bag-net some fifteen feet long with an oblong open mouth of ten feet wide by about 2½ feet deep. From this net animals are prevented from escaping, once they have entered, by a second smaller bag-net attached to about the middle of the inner side of the outer net, with its rather small open mouth hanging freely about two feet from the bottom of the outer net. The iron framework for the support of the net consists of two stout and broad U-shaped pieces of iron, held rigidly apart at a distance of ten to twelve feet by a very strong iron bar passing between the curved part of the U's. To the extremities of this bar ropes are attached; these unite in an eye to which the wire rope for trawling is shackled. The mouth of the trawling net is firmly bound to a light chain, which in turn is strongly tied to the extremities of the limbs of the U pieces. Round the margin of the bag-net passes a stout rope to which the net is fixed on one side, and at intervals on the other side, hemp swabs. The end of the bag-net is tied up, made fast to this rope, and weighted with a couple of iron sinkers. The trawling rope is a wire rope, thin and flexible, but very strong, and is kept coiled on a heavy iron drum bedded in the lower par of the ship aft. From this the wire passes, when in use, up a hatch way, through a series of blocks to the fore-part of the ship where it makes several turns round the drum of a winch, passes through the hawse-hole, through a block attached near the bowsprit end, and so to the trawl. Alongside the bowsprit is suspended a strong spring consisting of a series of rubber discs in an iron framework, so arranged that when the ends of the framework are separated the rubber discs become compressed. One end of this spring is firmly fixed to the bows of the ship, while to the other is attached the last block through which the trawling wire passes. Consequently, any strain put on this wire is at once indicated on the spring by the compression of the rubber discs.

Before trawling, the positions, depth, and character of the bottom have to be ascertained. The first is obtained by the customary sea methods, the last two by the deep-sea sounding apparatus, the one commonly used consisting of a hollow iron tube furnished inside at its lower end with a pair of butterfly valves, opening upwards and suspended from a galvanized iron piano wire. This wire is kept coiled on a drum fixed on the fo'castle, and, when running out, passes over a second drum, the circumference and number of revolutions of which are accurately known, and recorded on a dial. To cause the sounding tube to sink in deep water a couple of iron weights, with cylindrical holes bored in the centre for the tube to pass through, are suspended near the bottom of the tube by a wire loop passing over a tumbling apparatus above the tube. Immediately on striking the bottom the tumbling apparatus, only kept in position by the weight of the sinkers, is released and liberates the sinkers which are left on the bottom when the sounding tube is reeled in. The velocity with which the tube descends causes it to sink into the mud or sand of the bottom, which rises up and partly fills the tube. On its withdrawal from the bottom the butterfly valves falling back close the tube, and retain the contents for examination and record on the charts. A deep-sea thermometer, specially constructed to withstand the great pressure, is usually sent down with the sounding tube and records the minimum temperature obtained. This, in the greatest depths of the Indian seas, north of 6 deg. N. —a little over 2,000 fathoms—only slightly exceeds freezing point. When a suitable bottom for trawling has been found, a tackle hanging from the end of a derrick is attached by a slip knot to the eye above the trawl, which is then raised from the deck and lowered into the water by means of the tackle. On reaching the water the tackle is released and the trawl, now only attached to the wire rope, is allowed to sink by its own weight. When it arrives at the bottom surplus wire to the extent of half to one-third the ascertained depth is paid out. From the structure of the trawl it is indifferent on which side it falls. The ship now very slowly steams astern, dragging the trawl along the bottom. After a suitable interval the wire rope is reeled in by the winch, the trawl again hoisted on deck by means of the derrick and tackle, and the contents of the net removed. If the bottom has been stony or rocky the swabs probably will contain a large assortment of animal life, but from muddy bottoms they seldom contain much. On bottoms that have been ascertained to be rocky, instead of the large trawl a much smaller dredge, in which the net is suspended within and protected by a stout iron frame, is used.

Off the west coast of India on two or three occasions, at about 1,000 fathoms, hermit-crabs inhabiting a very interesting abode have been obtained by the *Investigator*. The usual practice of most species of these animals is, of course, to thrust the soft parts of their body into an empty mollusk shell into which they can withdraw entirely in case of alarm. Here, however, the hermit-crab grows to a considerable size, and the supply of a correspondingly large shell is scanty. It has accordingly come about that on the back of the shells inhabited by the crabs grows a budding cluster of deep-sea anemones, united at their base by a thick cartilaginous-like material. At first these anemones are supported by the shell, but as the crab grows too large to be contained in this, the anemone grows out *pari passu* from the mouth of the shell and secretes a thin, flexible but tough horny-looking covering for the crab to dwell in, at the same time gradually absorbing the shell which first supported them. It finally results that large hermit-crabs are found living in a spiral chamber entirely secreted and covered by a compound anemone, while the shell – the original habitation—exists as a mere ghost of its former self. It is small, almost invisible, thrust to the margin of the anemone, partly absorbed and the remaining fragment so soft as to be easily cut with a knife. A still more curious custom was observed in some hermit-crabs obtained from about 100 fathoms off the west coast. These animals have largely given up the practice of living in shells; instead, they carry about over their abdomens a flexible, thin, soft sheet of anemones, retaining it in position by means of their third pair of claws, and on occasions drawing the sheet with these claws right up over their backs to the root of their eyes, so that they are nearly hidden under the sheet. They were observed hiding in this way when brought aboard alive.

Between Colombo and Rangoon the passage was uneventful and beautifully smooth, and the occasion was utilised to observe the flight of the flying fish, about which so many erroneous notions prevail. The opportunities for observing its flight were almost ideal—plenty of fish, a calm sea, a not very fast ship and a coign of vantage—the paddle-box—to observe from. By far the commonest flying fish of these seas—*Exocœtus evolans*—is rather small, averaging between six and seven inches in extreme length, but growing somewhat larger. They are stout, muscular fish, very dainty to eat, and feeding mostly on the small forms of surface-swimming crustacea. They are protectively coloured—dark blue above fading into lighter shades below. Like their near allies the gar-fish, *hemiramphus*, which have a very similar habit of leaping from the water and rushing at great speed along the surface with merely the lower part of the tail and the hinder fins immersed, the flying fish, *exocœtus*, have the lower surface of the body flattened—evidently to make immersion more difficult and the act of springing from the water easier—and in both fish the lower lobe of the tail is considerably prolonged downwards. The anterior pair of fins of the flying fish are greatly enlarged and fan-like, and attached to the body by fairly strong, well-developed muscles, easily seen on pulling off the fish's skin. If their flight be followed with a pair of binoculars, it will be seen that, as they leave the water, the wings are for a second or two very rapidly vibrated; that the fish, having thus acquired a considerable impetus, soars along on its outspread wings, sometimes altering its direction of flight even to a right angle or more without touching the water; that when its speed diminishes it descends and either flops back into the water with a splash, or renews its flight by curving its body, so that the lower lobe of the tail and the hinder pair of fins rest on the water, steady it, and allow it to again vibrate its wings sufficiently rapidly to regain speed and its soaring flight. On one occasion a fish was observed to renew its flight, by alighting for a second on the water, no fewer than seven times. The speed at which flying fish can travel is considerable—certainly over ten miles an hour, probably nearly fifteen. The distance to which they can fly by alternately alighting on the water and then soaring along, may considerably exceed one hundred and fifty yards, and it appears to make little difference to them whether they sail up a light wind, down or across it, or whether it be a calm.

After entering the Andaman Sea, to the east of the Andaman and Nicobar Islands, a line of soundings and observations of deep-sea temperatures was made. It was stated that the temperature of the deepest parts of the Indian seas, a little over 2,000 fathoms, was only slightly over freezing point. In the Andaman Sea, however, at a depth of 1,500 to 1,700 fathoms, the temperature was found to be the same as at about 800 fathoms, *viz.*, 41 deg. F. The explanation of this curious but well recognised state of affairs is that the coldness of the deep-sea water is solely due to a slow influx of the cold heavy Antarctic waters creeping along the bed of the ocean from the polar to the tropical regions. Should any barrier be encountered by this moving mass of water, it would obviously either stop the movement, or force the water up into the warmer water corresponding to the depth of the top of the barrier below the surface. And this is actually the state of affairs in the Andaman Sea. The only very deep channel affording communication between the depths of this sea and the Bay of Bengal is the channel between Sumatra and the Nicobars. The survey of this channel is incomplete, but what soundings there are show that there is probably a ridge uniting the opposite sides of the channel at a depth not exceeding 900 fathoms, roughly. Hence, all the water below the depth of 900 fathoms within the enclosed Andaman Sea is at the uniform temperature of 41° F.—the temperature of water at about the same depth in the Bay of Bengal ; while outside, in the open Bay of Bengal, the temperature gradually diminishes as the depth increases.

After coaling and provisioning, the *Investigator* at once left for Moulmein. The preliminary work for the survey of the river was of an arduous description, involving long tramps across the steaming paddy fields to the low hills on either side of but a few miles distant from the river. Moulmein itself is a most picturesquely situated town, viewed from the river. On a bright cold-weather morning few scenes could exceed the beauty of the green foliage, with the most graceful, glittering, and slender spires of pagodas overtopping the trees and the pagoda-crowned ridge overshadowing the long struggling town. To the east and up the Salween are the high hills close to the borders of Siam, while to the north and west lies the fertile Bruxe Island with its range of low-wooded hills. The numerous hills rising to the eastwards of Moulmein have a most curious appearance as they rise straight out of the perfectly level surrounding country, often to a height of a thousand or more feet. They are mostly of limestone formation, and are often locally celebrated for their large caves, ornamented with stalactites and stalagmites and frequently forming the roosting places of enormous numbers of bats, the guano of which is collected and sold. A similar hill to these near Kollado, the nearest outport to Karennee, actually has a small stream running right through its base. On the top of many of these limestone hills lives the Burmese serow, an animal seldom obtained by English sportsmen although often trapped and killed by the Karens. While lying at anchor off the town of Moulmein the high spring November tides brought down quantities of drift-wood and on three successive mornings there were taken from the paddle box snakes, which had journeyed down as passengers on the drift-wood and been checked in their downward course by our paddle floats. On another morning a leopard was discovered by the coolies, when they went to work, on a lighter just ahead of the ship. They attacked and drove it overboard, and followed it up in a boat, making numerous very badly aimed blows at its bobbing head. Up the R. I. M. S. *Nancoury's* anchor chain it tried to scamble, but failed, swam ashore, and was shot, sinking and being carried by the strong tide below a pontoon, whence it was subsequently dragged with long poles.

The Marine Survey had the good fortune to be present in Moulmein at the time of Lord Elgin's visit, and to admire the decorations, which were of the most lavish description, and thoroughly appreciate a posture dance given by some twenty young Burmese girls in honour of the visit. The lights, the flashing jewels, the prettily shaded pale blue and pink silk dresses, the most infectious music, and the graceful and harmonious poses of the girls, altogether made up a charming picture which it will be impossible to forget.

At the mouth of the Moulmein river lies the small town of Amherst, and on the coast slightly to the south of this on several occasions a landing was effected. Here the country becomes undulating, with hills rising to a few hundred feet and densely wooded to their summits, but at their bases the trees have been cleared in places to make durian, mangosteen, and sugar-cane gardens. Unfortunately these gardens are said to be extremely unhealthy during the rainy season, but inhabitable at other times of the year. In these hills and in the scrub jungle near Amherst live large numbers of jungle fowl, barking deer, mouse-deer and pig, and a few leopards, tiger, and sambhur. They are also inhabited by more undesirable animals in the form of minute ticks, so small and so numerous that one's hands often look as if peppered ; by large numbers of both the large dark green and the small straw-coloured scorpions ; and by many snakes—the last, fortunately, usually of a harmless species. One of the most vividly coloured of the Indian snakes, *Coluber oxycephalus*, was caught here, and afterwards deposited in the Calcutta Zoological Gardens, where it is probably still being exhibited.

(The above appeared in the *Times of India* on 30th May, 1899.)

NO. XIX.—NOTE ON *EUMENES CONICA*, FABR, AND *MEGACHILE DISJUNCTA*, FABR, AND THEIR PARASITES *CHRYSIS FUSCIPENNIS*, BRULLE, AND *PAREVASPIS ABDOMINALIS*, SMITH.

Mr. Aitken's note on "A Wasp and a Fly" in Vol. XII, No. 2 of the Magazine, recalls some observations I made some eight or nine years ago on the abovementioned Fossorial wasp and bee and their parasites. I noted down the details of the incidents at the time and here they are :—

Moulmein, April 24th.—Noticed a half-finished mud cell of *Eumenes* being made on the woodwork of a window in my study. While examining it closely with a lens, the wasp returned with a pellet of mud and buzzed rather angrily round my head. I moved away a little and watched her. After flying round for a while she alighted close to the half-finished cell and walking up to it stuck the mud she was carrying on to one side of it and proceeded to work it into the wall of the cell kneading it, so far as I could see without approaching too close and frightening her, with both jaws and forelegs. Then she retreated a little as if to take a view of her work, and in a few seconds flew away to return with more mud. It was easy enough to recognize the species, it was *E. conica,* the commonest of the Fossorial wasps in Burma. I watched for nearly an hour while the nest was being completed. It then formed the half of a hemispherical shell, somewhat smaller in circumference than a rupee, with a circular opening at the top. When the cell walls were so far finished the wasp flew off and was absent fully half an hour. During her absence one of those metallic green cuckoo wasps, subsequently identified as *Chrysis fuscipennis* alighted near the nest, approached it cautiously, examined it quickly, both inside and out, and then retreated behind the edge of the wooden framework where it remained motionless, apparently on the watch. Presently the *Eumenes* returned carrying a green caterpillar. She alighted on the window and after some preliminary inspection of her nest, and hauling and dragging of the caterpillar, crammed it into the cell. She took quite a long time over it, with sometimes, her head and thorax inside, and sometimes her abdomen. All this time the Cuckoo-wasp remained perfectly still watching. As soon, however, as the *Eumenes* had flown away, the *Chrysis* approached the nest again, slowly and apparently with great caution. She walked round it then up the side, and peeped in, withdrew her head, seemed to give a final good look all round and popped in. She could not have been more than a few seconds inside, when a loud buz announced the return of the rightful owner of the nest. I had barely time to glance at the *Eumenes*, which alighted, as before, on the window, when my attention was attracted by the darting out of the cell of the burglarious Cuckoo-wasp. The *Eumenes* saw it, too, and, with what sounded very like an angry buz, dashed after it in pursuit, overtook it, and then the two dropped to the ground. I ran out but I had to go round by a veranda too high to jump, to the steps, and by the time I arrived on the ground the fight was over and the *Eumenes* had disappeared. The *Chrysis*, however, lay on the ground crippled and crawling painfully with all its wings torn off close to the roots. I have the specimen and one torn forewing which was all I could find, in my collection still. Returning to the nest, I sat and worked at a table near it for more than an hour, and inspected it at intervals through that day, but the *Eumenes* never returned, and next morning the cell was still open and unsealed. I tried to take it off with care but it broke to pieces. Inside was one green caterpillar, and two semi-transparent white eggs, one much smaller than the other; of these eggs the larger one was stuck against the wall of the cell, the other deposited on the caterpillar. I may mention that the caterpillar was quite dead.

Kawkareik, June 11th.—A bundle of bamboos, collected as specimens, stands in the corner of the centre room of the Forest bungalow. A leaf-cutter bee (*Megachile disjuncta*, Fabr.) has been industriously carrying in, for the last two hours, little circular pieces culled from the leaves of a rose bush in the garden. Of course she is constructing a nest in the hollow end of one of the bamboos aforesaid. I watched her as she flew in with her load to the corner and saw her disappear down the hollow end of one of the outermost bamboos in the bundle. When she flew out again, I approached to see whether I could examine the nest. As I neared the corner I noticed another bee (*Parevaspis abdominalis*, Smith) walking up the identical bamboo in which the *Megachile* had her nest. It scrambled up the bamboo, looked in at the hollow and disappeared. Expecting ructions when the *Megachile* returned, I watched Mrs. *Parevaspis* remained out of sight for some time, then put her great broad head out, gave a look round and again retreated. Presently, the *Megachile* returned carrying building material as before, and alighted on the very edge of the hollow in the bamboo preparatory to descending inside. The hollow was small, just big enough perhaps to let an insect slip through, about twice the *Megachile's* size, but not sufficiently large for the *Parevaspis* to get past the *Megachile*, because of the former's huge head. As I said the *Megachile* halted on the edge of the hollow in the bamboo. Suddenly the bit of leaf she was carrying was knocked out of her hold, and she herself pushed off the edge of the bamboo. It was Mrs. *Parevaspis*, of course, who had rushed up and thrust her great head out of the hollow. And there she stayed on the defensive with her jaws widely expanded and threatened. Poor *Megachile*, she seemed greatly taken aback, buzzed around angrily, but could not make up her mind to attack and dispossess the intruder of her nest. For about an hour affairs remained in this condition, then I was obliged to go out on work, and when I returned in the afternoon the *Megachile* had peaceful possession of her nest again, but what became of the *Parevaspis* or how she was ejected I have no idea. Next day the *Megachile* had finished her nest and I took the bamboo as it stood. I kept it for over six months, but nothing hatched out, and when I opened the hollow, I found ants had got at the nest and entirely destroyed it.

C. T. BINGHAM, Colonel,
Conservator of Forests.

Camp Maymyo, Upper Burma, *24th May*, 1899.

No. XX.—JUNGLE NOTES.

Chital.—On the 24th of March last I had just beaten out and killed a tiger when a spotted stag with fairly good antlers came galloping along the bank of a nullah I shot the animal as it was descending the bank, and it dropped dead into a pool of water. I was then surprised to find that both the horns had fallen off, and were lying beside the dead stag. This would not have been remarkable but for the fact that at this season of the year the horns of the chital are just mature, and not ready for casting.

Although as a rule a shy animal, the spotted deer is sometimes very bold, or rather, I should say perhaps, foolish. A few days before the occurrence described above I came across a herd of chital, and at once sat down to try and distinguish the stag. The herd, however, consisted entirely of hinds, one of which saw me, and came walking in my direction, gazing intently, and barking at intervals, until within about 40 yards. I then moved on, and the herd followed me for some time, some of its members barking continually. No wonder these animals fall an easy prey to tigers.

Bison.—I have frequently heard it said, and seen it stated in books, that bison never feed in cultivation. I know a village, however, surrounded by jungle, in the vicinity of which is a considerable area of rice fields, where bison are in the habit of feeding every night during the hot weather. The Gond shikaris take advantage of this and pot the animals from trees on moonlight nights, or when they are leaving the cultivation at dawn. Last year an old Gond shikari whom I used to employ was killed by a bison which he had wounded in this manner. I have always found the bison to be a very mild animal, but this old Gond had had a different experience, for he had been tossed by a wounded bull some years before, and I saw the scars of the injuries he had received on that occasion. Another Gond, a veritable wild man of the woods who was with me this year, told me of an encounter he had seen between a tiger and a great solitary bull bison, in which the latter managed to beat off his antagonist. In a similar encounter, of which I heard some years ago, the bison, a very large bull whose head was shown to me, was killed and partly devoured. His assailant, however, did not escape scot-free, for when subsequently killed by a friend of mine (who, by the way, met him one morning, and shot him with a single-barrelled ·450 express rifle) he was found to have sustained considerable injuries about the head, and I think had one eye gouged out.

Wild Dogs.—These pests appear to be growing more numerous every year. This year two of my buffaloes, tied up for tigers, were killed by them. On another occasion one of my buffaloes was killed by a panther. After passing the kill next morning, my shikaries saw the panther going off over the hills with a pack of about thirty wild dogs in full cry after him. In the evening I found a wild dog with a small pup feeding on the carcase of the buffalo, but unfortunately made a bad shot and missed the vermin. The same pack of dogs had cleared the whole valley of game, including three tigers which I had hoped to have brought to bag. They kept to the lower end of the valley where the tigers had previously been living and not a mark was to be found, but after some days the biggest of the tigers fortunately came down to the head of the valley, eight miles off, beyond the range of the red dogs, and there I shot him.

Another year I shall certainly take a supply of strychnine, and try and poison some of these destructive animals, which not only kill a great number of deer, but drive away game of all kinds.

R. G. BURTON, Captain,
1st Infantry, Hyderabad Contingent.

Jalna, 31*st May*, 1899.

No. XXI.—FOOD OF THE KING COBRA AND KRAIT.

On the 26th March, 1898, while working on the Bagho Bahar tea estate, one of the coolies brought me a fair sized Hamadryad which he had killed. He said that he had watched it killing and eating another snake. On examining the specimen and the contents of its stomach, I found that it contained a fine Banded-Krait (*Bungárus fasciatus*) which it must have killed while feeding on a grass snake which was half way down the Krait's throat.

Measurements of the three snakes were as follows :—

The Hamadryad	7′	5½″
The Krait	3′	1¼″
The Grass Snake	2′	9″

A. M. PRIMROSE.

Silchar, *May*, 1899.

No. XXII.—NESTING OF THE BLACK EAGLE.

There are few that have had the good fortune to take a nest of the Black Eagle (*Neopus malaienses*) and its nidification in South India has not been authenticated as far as I know.

Davison and Margan, both ardent naturalists, failed to discover a nest of this fairly common bird on the Nilgiris, but Mr. Lawson Margan has taken a nest of this Eagle in the Wynaad early in January.

It would be interesting to know where this handsome bird breeds and where the eggs have been taken.

W. MAHON DALY.

Lakon, Siam, 20*th May*, 1899.

No. XXIII.—A FLYING SNAKE.

On the 4th February last when I was marching to my camp at Thingannyinaung, with my Kareen interpreter, we both clearly saw a snake, about 2½ feet long, sail from a very high tree on one side of the road to a lower one the opposite side.

I have related this fact to men who have spent many years in Burma and Siam, but it is astonishing to say not one of them will believe it. I can find no record of a flying snake, so this note, I hope, will be interesting.

The "flying" lizards (Draco) and flying squirrels are common here, so why not a so-called flying snake?

W. MAHON DALY,

Lakon, Siam, 20*th May*, 1899.

PROCEEDINGS

OF THE MEETING HELD ON 28TH FEBRUARY, 1899.

A meeting of the members was held at the Society's Rooms on 28th February 1899, Dr. D. MacDonald presiding.

NEW MEMBERS.

The election of the following new members was announced :—Mr. S. D. Keany (Berars), Mr. Herbert Swayne (Ceylon), Mr. Edmund W. Harper, F.Z.S. (Bombay), Rev. Father Mathew Loehle, S.J. (Bombay), Captain E. M. Lachlan, R.A. (Kirkee), Mr. E. G. L. Laird-Macgregor, I.C.S. (Belgaum), Mr. Charles A. R. Crommelin (Bombay), Captain D. H. Drake-Brockman (Meerut), Mr. Hugh M. Hannay (Giridih), Lieutenant George A. Hawks (Cuddapah District), Lieutenant Henry Storr (Wellington), Mr. Oliver Collett, F. R. M. S. (Watawala, Ceylon), Mr. Ivor C. Thomas (Mandalay), Lieutenant R. H. Price, I.M.S. (Kurram Valley), Captain L. C. Dunsterville (Delhi), Captain R. W. Falcon (Peshawur), Mr. W. A. W. Dawn (Moulmein) Captain A. R. Dick (Calcutta), Major H. S. Massy (Loralai), Lieutenant F. Smith, I.M.S. (Loralai), Mr. Sidney B. Taylor (Kurrachee), Pundit Jewala Prasada, I.C.S. (Orai), Mr. H. W. A. Watson, I.F.S. (Toungoo), Mr. E. L. Phelps (Ireland), and Mr. F. G. Hutchinson (Kharaghora).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
A Collection of Bird's Eggs...	....	Capt. P. Z. Cox.
1 Chamæleon (alive)	*Chamæleon calcaratus* ...	Mr. C. Merroney.
1 Small Indian Mongoose (alive).	*Herpestes auro-punctatus*	Do.
1 Stoliczka's Hedgehog (alive).	*Erinaceus pictus*............	Do.
2 Black Bears' skins	*Ursus torquatus*	Mr. C. Donald.
1 Musk Deer's skin	*Moschus moschiferus*	Do.
1 Goral's skin	*Cemas goral*	Do.
Eggs of the Ring-tailed Sea Eagle.	*Haliætus leucoryphus.* ...	Do.
1 Hawk-Cuckoo	*Hierococcyx varius*.........	Do.
1 Ibex head	*Capra Ægagrus*	Deposited by Capt. P. Z. Cox.
Eggs of the Roseate Tern ...	*Sterna dougalli*	Mr. E. H. Aitken.
1 Duck-billed Platypus	*Ornithorhynchus anatinus*	Mrs. Evans.
1 Barn Owl (alive)	*Strix javanicus*..............	Mr. S. V. Bhandakar.
1 Rat (alive), with curious skin disease.	....	Capt. J. C. Milne, I.M.S.
2 Eggs of the Rock Horned Owl.	*Bubo bengalensis*	Mr. A. H. Simcox, I.C.S.
1 Flamingo	*Phœnicopterus roseus*	Vety. Capt. W. D. Gunn.
1 Clucking Teal	*Nettium formosum*	Mr. E. L. Barton.
1 Large Shell from Mombassa.	*Turbo sp.*	Lieut. H. B. Rattray.

Contribution.	Description.	Contributor.
1 White-eyed Duck	*Nyroca ferruginia*	Mr. P. R. Allen.
1 Black Lemur (alive)	*Lemur macaco*	Mr. Goverdhundas G. Tejpal.
2 Snakes	*Dryophis mycterizans*	Mrs. Oliver.
1 Snake	*Dendrophis pictus*	Do.
1 Snake	*Dipsas ceylonensis*	Do.
1 Snake	*Lycodon striatus*	Do.
1 Snake	*Typhlops acutus*	Do.
Orchids	*Eulophia pratensis*	Mr. A. H. Simcox, I.C.S.
Eggs of Common Sandgrouse.	*Pterocles exustus*	Do.
1 Tree Snake	*Dendrophis pictus*	Mr. J. E. Whiting, C.E.
1 Young Jackal (alive)	*Canis aureus*	Mr. W. George.
1 Brown Fish Owl	*Ketupa zeylonensis*	Mr. G. Watts.
2 Bats	*Scotophilus wroughtoni*	Mr. R. C. Wroughton.
1 Bat	*Pipistrellus dormeri*	Do.
1 Bat	*Pipistrellus indicus*	Do.
1 Chamæleon (alive)	*Chamæleon calcaratus*	Mr. H. Knight.
1 Stoliczka's Hedgehog (alive).	*Erinaceus pictus*	Mr. J. W. Hind.
1 Red-Crested Pochard	*Netta rufina*	Mr. P. Snow, I.C.S.
1 Bittern	*Botaurus stellaris*	Mr. A. H. Simcox, I.C.S.

CONTRIBUTIONS TO THE LIBRARY.

On the Nomenclature of the Whalebone Whales (True), in exchange; "The Irish Naturalist," from Mr. W. F. Sinclair; "Nature," from Mr. W. F. Sinclair; Journal of the Marine Biological Association, from Mr. W. F. Sinclair; Mammals of the Kaskill Mountains (Mearns), in exchange: Catalogue of the Birds in the British Museum, Vol. XXVI., in exchange; Insects injurious to Stored Paddy (E. Ernest Green), from the author; Birds of the Larut Hills, Perak (A. L. Butler), from the author.

THE ACCOUNTS FOR 1898.

Mr. N. C. Macleod, the late Honorary Treasurer, placed before the meeting a statement of accounts for the year ending 31st December, 1898, showing an income of Rs. 14,216-3-5; expenditure, Rs. 12,812-8-8; and a balance at credit of Rs. 1,403-10-9. It was resolved that the accounts be passed subject to the usual audit.

ELECTION OF THE COMMITTEE.

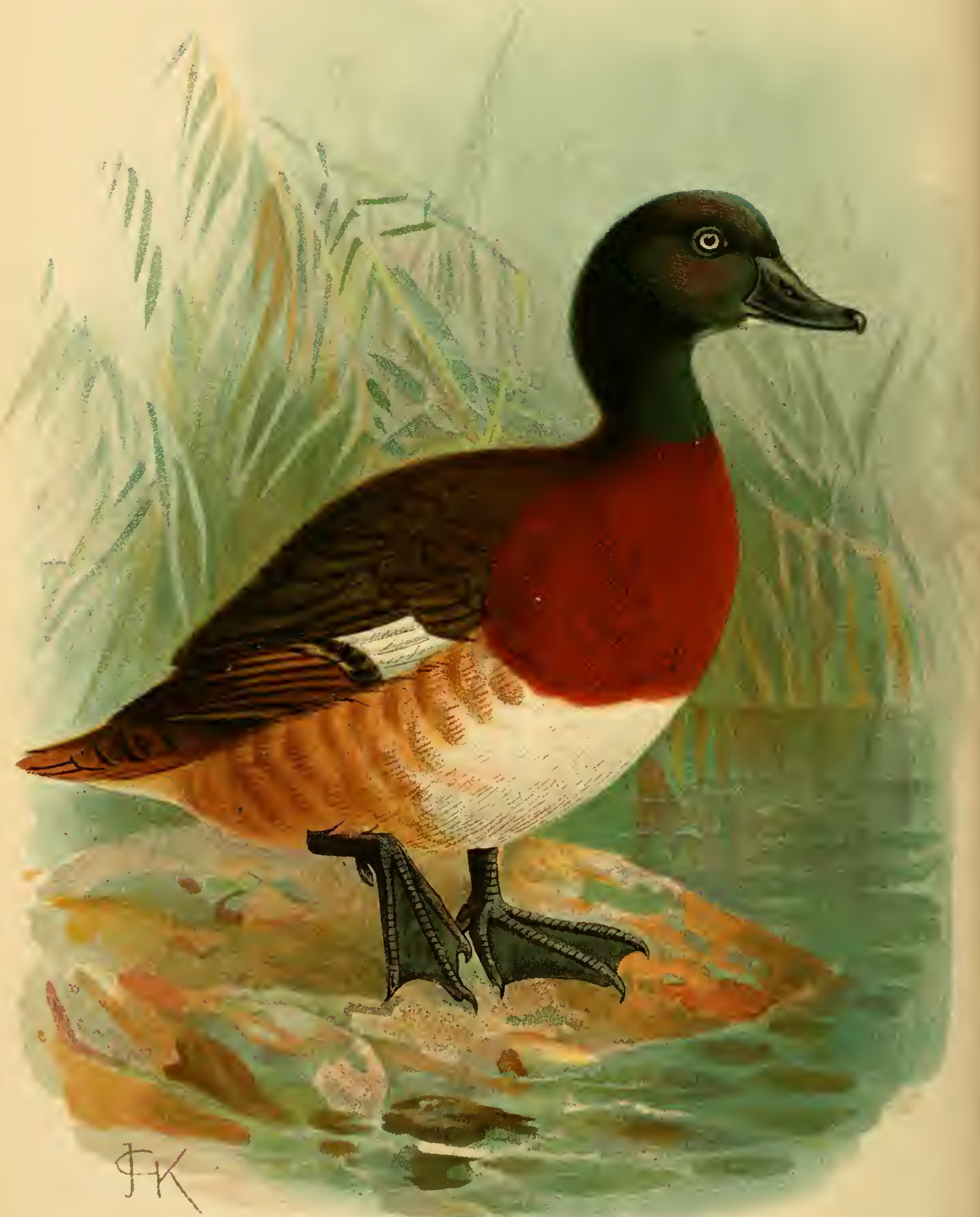
The President, Vice-Presidents, and Members of the Managing Committee for 1898 were re-elected for the present year.

PAPERS READ.

The following papers were read and discussed.—1. Fishing in Indian Waters. Part II, The Mullet and Garfish, by F. O. Gadsden, R.I.M. 2. The Ferns of North-Western India, by C. W. Hope. 3. On the Land Mollusca of Bombay, by W. T. Blanford, F.R.S. 4. Notes on some Butterflies from Tenasserim in Burmah, by Lionel de Niceville, C.M.Z.S. 5. Birds collected and observed at Thull during 5 months in 1898, and Notes on their Nidification, by Major R. H. Rattray. 6. Birds of the Andaman and Nicobar Islands, by A. L. Butler, F.Z.S. 7. Notes on the Himalayan Viper or Pohur, by Captain F. Wall, I.M.S. 8. On the Colouration of the Wing-lining and Axillaries in the Fantail and Pintail Snipes, by A. L. Butler, F.Z.S. 9. The White Snake (*Coluber taeniurus*), by A. L. Butler, F.Z.S.

MISCELLANEOUS NOTES.

(*a*) A Wasp and a Fly, by E. H. Aitken. (*b*) A Mark on the skin of a Man-Eating Tiger, by Lieut.-Col. W. B. Ferris. (*c*) A Bush-Quail and Rain-Quail laying in the same nest, by Lieut. E. C. Harrington, R.A. (*d*) Birds tapping at Window-panes, by E. Ernest Green. (*e*) Occurrence of the Alpine Swift in Tirhoot, by C. M. Inglis. (*f*) Early Migration of the Ruddy Sheldrake, by T. F. L. Beaumount. (*g*) Occurrence of the Clucking Teal in Guzerat, by E. L. Barton. (*h*) Notes from Zhob, by Captain C. D. Lester.



J G. Keulemans del.

Mintern Bros Chromo lith London.

BAER'S POCHARD.

Nyroca baeri.

2/5 Nat size

JOURNAL

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INDIAN DUCKS AND THEIR ALLIES.

BY E. C. STUART BAKER, F.Z.S.

PART VIII, WITH PLATE VIII.

(*Continued from page 464 of this Volume.*)

Sub-Family FULIGULINÆ.

This sub-family is divided from those already written about by having the hind-toe broadly lobed; whereas the latter have the hind-toe either with no lobe at all, or else with only a very narrow one. Blanford does not divide the *Fuligulinæ* from the *Anatinæ*, but the division seems to be a very natural one, the members of the sub-family differing from those of others, not only in construction, but also, considerably, in habits as well.

The separation of *Erismatura* is by no means so distinct, and the genus is not, in my opinion, worthy of separation from the *Fuligulinæ* and the honour of a sub-family to itself. Having however followed Salvadori in his classification throughout so many numbers of this article, it is better, perhaps, for the sake of uniformity, not to differ from it now.

Erismatura differs from those ducks included by Salvadori in his sub-family *Fuligulinæ* in certain external structural particulars, principally in the swollen base to the upper mandible and in its remarkable tail, the which, as Blanford remarks, looks as if it might be that of a woodpecker.

The *Merginæ* are separated from all other ducks by the shape of their bill, which is long, narrow, and pointed, altogether most un-duck-like in its appearance.

The *Fuligulinæ* contain thirteen genera, of which four only are represented in India; but it is worthy of notice that whilst *Netta* is one of our most common forms and *Clangula* one of the most rare, both *Nyroca* and *Fuligula* contain forms which are extremely common, and others again of the greatest rarity.

Key to the Genera.

a. Primaries with the bases more or less white.
  a'. Lamellæ long and prominent ....*Netta.*
  b'. Lamellæ short, well apart, not very prominent.
    a''. Bill very nearly the same width throughout ...*Nyroca.*
    b''. Bill distinctly wider at the tip than at the base..*Fuligula.*
b. Primaries without any white or whitish on the bases..*Clangula.*

Genus NETTA.

The genus *Netta* contains but one species, distinguished by its bill, which tapers very gradually throughout its length and has the lamellæ very stout and prominent.

The male bird also has a full bushy crest, which has, however, no existence in the female.

The name Pochard should be pronounced Pokard, not with the soft *ch* with which I have heard many sportsmen sound it. In many parts of England these ducks are known as Pokers or Poke Ducks, and it is from this the name is derived.

(30.) NETTA RUFINA.

The Red-crested Pochard.

Branta rufina.—Jerdon, "Birds of India," III, p. 811; Butler, "Str. Feath.," IV, p. 30; *ibid*, V, p. 203; Fairbank, *ibid*, IV, p. 264.

Fuligula rufina.—Hume, "Str. Feath.," I, p. 264; Adam, *ibid*, p. 402; Hume, *ibid*, VII, pp. 98 and 493; Ball, *ibid*, p. 232; Crips, *ibid*, p. 402; Hume, Cat., No. 967; Hume and Marshall, Game Birds, III, p. 253; Legge, "Birds of Ceylon," p. 1087; Butler, "Str. Feath.," IX, p. 438; Reid, *ibid*, X, p. 84; Taylor, *ibid*, pp. 528 and 531; Barnes, "Birds of Bombay," p. 412; Hume, "Str. Feath.," XI, p. 346.

Netta rufina.—Salvadori, "Cat. of British Museum," XXVII, p. 328; Blanford, "Avifauna of Birds—India," IV, p. 456.

Description : *Adult Male.*—Whole head reddish-bay, richest and darkest on the under surface and sides, paling from the forehead to the end of the crest where it is reddish-buff. Neck blackish-brown ; upper back dark brown, getting more and more pale towards the rump, the bases of the feathers next the scapulars shewing in a white band ; rump and upper tail-coverts blackish-brown, more or less glossed green ; tail silvery-grey brown ; breast blackish-brown paling on the lower breast and abdomen ; under tail-coverts dark brown ; flanks, ascillaries and under wing-coverts white ; coverts bordering the wing and running into the scapulars white ; other coverts greyish-brown ; secondaries white, sometimes tinged grey or creamy, with a sub-terminal band of brown from 25″ to 4″ wide ; inner secondaries like the coverts ; outermost primary brown on the outer web and inside of the inner web and tip, the remainder white, this white gradually increasing in extent on each primary until the innermost primaries are all white with a broad brown tip.

Bill vermilion-red ; the nail whitish tinged pink or sometimes yellowish, the base next the feathers of the forehead, and the gape more or less dusky brown except in the oldest birds ; legs and feet orange, orange-red or dull fleshy-red ; irides deep or light or reddish-brown to bright light red.

" In the adult male, the bill is a brilliant crimson, sometimes inclining to vermilion ; the nail brown or white, tinged with brownish horn, or pink horny brown or yellow at tip. There is often a dusky shade round the nostrils ; the gape is often blackish as is likewise the base of the lower mandible and the basal portion of the membrane between its rami ; but these are all traces, I think, of immaturity."

"The legs and feet are dingy salmon-colour or reddish-orange, dusky on the joints and blackish on the webs ; but in slightly younger but full plumaged birds, the legs and feet will be olivaceous-orange, or lastly, dusky with a reddish tinge."

" The irides vary from brown to red (this latter being the colour in the old adult) and are at different ages, brown, brownish-yellow, reddish-brown, orange, orange-red and bright red."

" Length 20·5″ to 22·1″ ; expanse 34·0″ to 38·2″ ; wing 10·0″ to 10·75″ ; tail from vent 3·0″ to 4·2″ ; tarsus 1·5″ to 1·7″ ; bill from gape 2·3″ to 2·42″ ; weight 1 lb. 12 ozs. to 2 lbs. 14 ozs." (Hume).

Female.—Above pale greyish-brown distinctly tinged with ochre; the crown rather darker; scapulars paler; the feathers of the upper surface with pale margins, practically absent in the oldest birds; the wings paler and duller but otherwise like those of the male, the white being replaced by pale grey or dusky white; whole lower plumage, under wing-coverts and axillaries, pale greyish-white, yellowish-white or greyish-ochre, darker on the flanks.

Bill dusky black, becoming red towards the tip and with the nail still paler, the lower mandible only dark at the base and up the fleshy part in the centre; irides brown or reddish-brown; legs and feet dusky orange, orange-brown or reddish-brown, the webs and joints darker, often dusky black.

"In the female the bill is black, reddish or orange towards the tip and more or less along the sides of the lower, and edges of the upper mandible" (Hume).

"Iris yellow; bill brownish-red above, fleshy beneath, nail brown; legs and feet murky yellow" (Legge).

"Length 20·1″ to 22·0″; expanse 33·75″ to 37·0″; wing 9·0″ to 10·25″; tail from vent 3·5″ to 3·8″; tarsus 1·5″ to 1·75″; bill from gape, 2·25″ to 2·4″; weight 1lb. 10ozs. to 2lbs. 6ozs." (Hume).

"Young male similar to the female, but the darker centres of the feathers of the underparts are brown instead of grey; back and breast darker brown and more indications of a crest" (Seebohm).

The colours of the soft parts are those of the female, the legs and feet being less tinged with red or orange, often of a uniform dull brown, barely tinged on the shanks with reddish; the irides are plain brown. The bill becomes redder before the full plumage is assumed, but does not become really red or crimson-red until the bird is pratically adult.

"*Males in first nuptial dress* have the under parts more suffused with brown, the white not suffused with pink, and the bill much paler" (Seebohm).

"*Males in moulting plumage* very closely resemble the adult females, but may be distinguished by the brighter colour of their bills and eyelids, by the greater development of their crests, by the darker brown of the belly and under tail-coverts, and by the redder colours of the feet" (Salvadori).

" Young in down are described by Baldamus as having the upper parts dull olive-grey, with a buff spot on each shoulder, and the underparts buff, a buff stripe passes over each eye, and through the eye runs a dark stripe, which divides into two behind the eye " (Salvadori).

The habitat of the Red-crested Pochard may roughly be said to be the countries surrounding the Mediterranean and Central-Western India.

It is common in South Russia, Turkestan, Persia, Afghanistan, Beluchistan, and thence in winter into India. Throughout the countries of Southern Europe it is common, and it ascends North as a frequent straggler to Northern France, England, occasionally as far as Scotland, North Germany, where it breeds, and Central Russia.

On the South coast of the Mediterranean it is much less common. It is rare in Egypt and Tangiers, more common in Algiers and West of Algiers, after which it has not been recorded further West.

In India, the Red-crested Pochard occurs practically throughout the whole of the North and Central India. It is common in the North-West Provinces, the Punjab, Sind, Rajputana and Oudh, Central India, and the Central Provinces, except in the South and the greater part of Bengal. In Assam it is less common, but by no means at all rare. Hume found it in Manipur in small numbers, and I have myself seen, shot, or had it recorded for me from Cachar, Sylhet and Dacca. In the Sunderbunds I found it decidedly rare, but have had it recorded as common by other sportsmen. In Southern India it must be rare everywhere, and it seems also to be rare in the extreme West, in Cutch, etc. There seem to be hardly any records of the bird in Southern India, but Layard was certain he had met with it in Ceylon, and it doubtless, therefore, must occur at odd times throughout the whole of the Indian Peninsula.

I can find no signed records of its occurrence in Burma, but there are anonymous, though apparently authentic, notes of its having been occasionally found there.

I have had it recorded from Chittagong, where, however, it is said to be very rare.

Although so many of these ducks have their homes quite close to India, yet, they are, on the whole, rather late arrivals, coming into the North and North-West India in the latter part of October and into Bengal and further South, not until well into November. In Assam and Manipur, however, I think they generally come in by October, and I have seen a pair about the 10th of that month.

In some parts of India they arrive in flocks of thousands; Hume writes in one place of "flocks of many thousands and acres of water paved with them," again "I rowed into a flock of this species, several thousands in number." Reid also, after saying that though (in the Lucknow division) he has come across them in small parties, as a rule, of a dozen or so, yet "one morning in December, I came across countless numbers on a jheel in the Fyzabad district closely packed and covering the whole surface of the water, with their red heads moving independently, while the breeze kept their crests in motion; a distant spectator might have mistaken them for a vast expanse of beautiful aquatic flowers."

As a general thing, therefore, it would seem that the Red-crested Pochard likes to congregate in very large flocks, and it is only when the country is not very well suited to their wants that they split up into small parties, and under these circumstances, very small flocks and even pairs and single birds may sometimes be seen.

They are open water birds by choice, frequenting large sheets of water, unobstructed by surface weeds, reeds, or water plants, except about the shores or banks. Of course, where they are most common, a few birds may be met with in almost any kind of water, but it is rare for any large flock to be found on vegetation-covered swamps, small dirty jheels, etc.

They are splendid swimmers, and regularly play about on the water with one another where undisturbed, and as divers, they are even better than as swimmers, though the White-eye may excel them in this respect.

Legge says: "This handsome Pochard, though belonging to the family of diving ducks, which are mainly characterized by their webbed or lobed hind-toes, is said by those who have observed its habits, not to dive for its food, but to feed, like ordinary ducks, in shallow water, with its neck stretched down and its body turned up."

This, too, is what Dresser says, but would appear to be distinctly contrary to what most observers have noted; what Hume records is what most of us have taken to be the habits of this bird: he writes thus after quoting Dresser's remarks: "I should like to know where he obtained this valuable information. The fact is, that though you *may*, at times, see it dibbling about in the water like Teal and Shovellers, or again feeding as he describes, its normal habit and practice *is* to dive, and I have watched flocks of them, scores of times, diving, for an hour at a time, with pertinacity and energy unsurpassed by any other wild fowl. Examine closely their favourite haunts, and you will find these to be almost invariably just those waters in which they *must* dive for their food. Deep broads, where the feathery water-weed beds do not reach within several feet of the surface, not the comparatively shallow ones, where the same weeds (the character of their leaves changed however by emergency) lie in thick masses coiled along the surface."

This is certainly my experience, and I noted in the Sunderbunds how very much this duck kept to the open, central portions of the huge bheels, feeding there on and amongst the aquatic plants, especially on a long, trailing, moss-like weed which grew several feet under water. Moreover, I have found in their stomachs the roots of plants which do not grow except in fairly deep water. They not only dive well and for long periods, but they also dive to no inconsiderable depths; and that it is a pleasure to them to dive is shown by their constant diving when at play, chasing one another both above and below the surface.

They feed both by day and night, but mainly in the early morning and evening; and though the very much greater portion of their diet is undoubtedly aquatic, yet they have been known to feed on young crops on dry land. Of course, like all or nearly all ducks, they rest during the hottest hours of the day, selecting quite open, deep water for that purpose, when it is available. They have the credit of being awkward and feeble on land, but that very close observer, Mr. F. Finn, says that it comes ashore more often than the other Pochards and walks better also.

No duck varies much more than does this one in the quality of its flesh, when at its best very few ducks indeed are better for the table, but at its worst the White-eye itself is but little more rank and coarse. This variability is, undoubtedly, due to its wide range of feeding. Naturally they are principally vegetable feeders, and when feeding on water plants and young crops, their flesh is naturally excellent; but when, as is sometimes the case, they feed on fish, shell-fish, water-insects, &c., they at once assume a rank fishy taste which no amount of seasoning will obscure.

Hume found one which had gorged itself on small fish about an inch in length, and I dissected one which had eaten, as far as I could see, nothing but the tiny red crabs which swarm in such countless myriads along the shores of rivers, swamps and back waters in the Sunderbunds, the waters of which are brackish. This was the only specimen, the contents of whose stomach I noted whilst shooting in Jessore and Khulna; but all we shot and tried to eat tasted the same, and I have no doubt that they too had been feeding on crabs.

Here in Cachar and Sylhet I should call the Red-crested Pochard one of the very best of ducks for the table.

They are strong fliers and go at a good pace, but they are very slow in getting up off the water, and take some time to get their pace up.

Finn says that their note is a harsh croak sounding like "kurr." This is the same syllablo as that used by Hume to represent their note, he calling their cry a "deep grating kurr." He also adds: "Occasionally the males only, I think, emit a sharp sibilant note—a sort of whistle quite different from that of the Wigeon and yet somewhat reminding one of that."

From a sporting point of view, the Red-crested Pochard is all that can be desired. About as smart as they make them, he seems to have special aptitude for judging the length of range of different guns; and a flock may be caught once, but seldom twice, whatever distance the gun may reach.

They swim so fast that they can by this means alone generally escape, and they are often very loath to rise when they can thus get out of shot. Their swimming powers, manner of packing, and capacitude for diving are so well shown by Hume's account of his shooting in the Etawah district that yet again I indent on him wholesale:—"All night long . . . I had heard water-fowl coming in, and the next morning, before dawn, I was out in my punt, working softly round the margin to the western side, so as to have the fowl, when twilight broke, against the daylight sky. I soon made out by their cries that the mass of the fowls were Pochards, that there were a vast number of them, and that a great number of them belonged to the present species. Day dawned, and I could soon see a dense mass of fowl . . . probably fully a quarter of a mile off . . . Lying down I paddled towards them. Very soon a fresh north-east wind sprang up against me; quite a sea rose. I was perpetually grounding, and they were swimming away steadily against the wind, so that it was bright sun light before I got within 200 yards, and then I could see they were all red-crests. I had now got into deeper water, and went as hard as I could without splashing; but they swam steadily away, and I must have gone fully half a mile before I had gained 100 yards on them. Still they had not shown the slightest signs of suspicion (and I knew their ways well), but were swimming gaily on *en masse*, head to wind, as they often will on windy mornings. On I went. I had a long heavy English swivel, carrying a pound of shot (No. 1 I had in); there were between two and three thousand of them as closely packed as they could swim. I was certainly within seventy yards of the hindermost birds; I calculated to get within about forty yards of these and fire over their heads into the centre of the flock. They were close-packed and backs to me, so there was little to gain, and possibly a great deal to lose by flushing them. I was within fifty yards, when again I grounded: had I even then fired at once, I must have made a very large bag, but I thought I knew that this was only the point of a mound, and I wasted some precious moments struggling to get over it with the paddles. The nearest birds must have been seventy yards distant before, seeing I was hard and fast, I snapped an ammunition cap on a little pistol I always carried for the purpose, and raked them as they rose. The next instant there was a whole line of birds fluttering on the water, seven dead and twenty-one winged. I recovered everyone of them, but it was noon before I bagged the last; and if I had had a desperate hard six hours' work, I hardly remember any six hours which I more thoroughly enjoyed."

This duck breeds throughout the southern countries of Europe, in parts also of Northern Africa and in the more northern parts of its Asiatic habitat, as far south as Shiraz in Persia. In Europe it is found breeding occasionally in Northern Germany, France, &c.; but its true breeding haunts are further south. In Central Germany it is common. Hume, referring to the nests taken by Dr. Baldamus remarks:—
"Dr. Baldamus who has taken many nests in Central Germany, all

however, on 'a pond over-grown with reeds, flags, and other aquatic plants, close to the Mansfelder Salt Lake,' tells us that they are 'always placed in the rushes or flags, usually in a small island in the pond or on the flags ; and, like all ducks' nests, they have a foundation of rotten stems, plucked rushes or dead leaves, on which a warm bed of down, plucked from the breast of the female, is placed. When the female leaves the nest quietly, she covers her eggs, as do all ducks. The eggs vary from eight to nine, ten being the exception, and seven only in late sittings.' All his nests were taken between the 12th June and 1st July, the later nests being much incubated, so that in this locality they probably lay from 1st May to the 15th June. The eggs are only moderately broad ovals, without gloss, a bright, somewhat olive-green when fresh and unblown (fading to a dull greyish-olive or greenish-grey when blown), and measure about 2·3 by 1·6."

Salvin writes :—" In the open pools at the upper end of the marsh at Zana, I used to see several pair of the red-crested duck. Two nests only were obtained. The second lot, consisting of seven eggs, were of a brilliant fresh green colour when unblown ; the contents were no sooner expelled and the eggs dry, than the delicate tints were gone and their beauty sadly diminished."

The nest is a large, coarsely-made structure which seems to be made almost invariably of practically nothing but rushes and soft water-plants. Twigs, dry grass and other materials got from land are but little used, and it is probable that much of what *is* used is subaquatic stuff and is got by diving. The lining of down and feathers is usually very dense and thick, completely covering the eggs.

As a rule, the duck selects as a site for her nest some small pond well covered with weeds and vegetation, or some patch of water in fen or marsh land, well isolated and free from observation and interference. I have come across no notes on their nidification to show that they ever breed on the edges of larger or more open pieces of water, and these they seem, as a rule, to avoid during the breeding season, unless, perhaps, for purposes of feeding. Wide marshes and fens, with pools scattered here and there in amongst the bog and scrub-covered land, would appear to be their favourite resorts.

When fresh, the eggs are a beautiful clear green stone-colour, and have a decided gloss, but lose both their bright tints and gloss soon after being blown. The texture is smooth, fine and close, but the shell is rather fragile for the size of the egg, and this would appear to be the case with most pochards' eggs.

In shape they are either rather long or rather broad ovals, very regular in shape, and with both ends practically the same in size.

The majority of birds breed in May and early June; very few, it would seem, as early as the end of April. The number of eggs is most often eight to ten, but they vary from only six to at least fourteen on a few occasions.

Genus NYROCA.

The genus *Nyroca*, according to Salvadori who divides *Fuligula* from *Nyroca*, contains ten species, of which three are found in India. *Nyroca* differs from *Netta* in the formation of the bill and lamellæ, the latter having them larger, more prominent and closer together than the former.

The genus is a cosmopolitan one, and amongst its ten species contains what is, perhaps, our most common duck, namely, *Nyroca africana* (or *ferruginea*), the White-eye.

Key to the Species.

(*a*) Back and scapulars distinctly barred or vermiculated...*ferina* ♂

(*b*) Back and scapulars merely speckled.

  a′. Head and neck dull chestnut or bay ....*africana*

  b′. Head and neck almost black ....*baeri* ♂

(*c*) Upper back and head rufous-brown, scapulars slightly vermiculated, no white speculum ....*ferina* ♀

(*d*) No vermiculations on upper plumage: a white speculum.

  a″. Head and neck rufous-brown.................... *africana* ♀

  b″. Head and neck more or less mixed with blackish on the sides ....*baeri* ♀

In addition, *baeri* may be discriminated from *africana* by its larger size and proportionately larger bill.

31. Nyroca ferina.

The Pochard or Dun-bird.

Aythya ferina, Jerdon, "Birds of India," III, p. 812; Hume, "Str. Feath.," I, p. 264; Adams, *ibid*, p. 409; *ibid*, II, p. 341; Butler, *ibid*, IV, p. 30; V, p. 234; Ball, *ibid*, VII, p. 232.

Fuligula ferina, David and Wend., "Str. Feath.," VII, p. 93; Hume, *ibid*, p. 496 ; *ibid*, Catalogue, No. 968 ; Hume and Marshall, "Game Birds," III, p. 247 ; Legge, "Birds of Ceylon," p. 1,090 ; Butler, "Str. Feath.," IX, p. 438 ; Reid, *ibid*, X, p. 84 ; David, *ibid*, p. 326 ; Taylor, *ibid*, p. 531 ; Barnes, "Birds of Bombay," p. 412 ; Hume, "Str. Feath.," XI, p. 346.

Nyroca ferina, Salvadori, Cat., "Birds of British Museum," XXVII, p. 335 ; Blanford, "Avifauna of British India," IV, p. 458.

Description : Adult Male.—Whole head and neck rich deep chestnut, changing rather abruptly into the black of the upper back and breast ; rump and upper-tail coverts dull black ; remainder of upper plumage extremely pale clear grey, very finely vermiculated with black bars ; wing coverts dark grey, more or less vermiculated with white ; primaries dark grey, edged outwardly and tipped blackish ; secondaries forming a dull grey speculum, the feathers narrowly tipped whitish and divided from the inner secondaries by narrow black borders to two or three of these feathers ; lower breast blackish, the feathers more or less fringed white ; remainder of lower plumage white, or very pale grey, sparsely stippled with black, the stipplings more numerous towards the vent and flanks ; under-tail coverts dull black ; tail dull greyish-brown, tipped paler.

Occasionally the male has a pure white spot at the apex of the shin, a skin lent me by this Society having the spot more highly developed than in any other specimen I have ever seen.

Irides yellow or reddish-yellow ; base and end of bill black, intermediate portion varying from pale, clear plumbeous-blue to rather dull dark plumbeous ; the legs vary through the same shades of grey or plumbeous-blue, darker and blackish on the joints and webs.

"The irides vary ; they are generally orange-yellow, but I have noted them brown in one apparently adult female and lac-red in an old male."

"The legs and feet are pale bluish or slatey-grey, or dull leaden, often darker on the joints, and with the webs black or nearly so. The bills are black and bluish-grey or leaden, in varying proportions. In some the whole bill is black, with only a leaden-coloured crescentic bar on the upper mandible towards the tip. In others only the tip and the basal portion of the upper mandible to a little beyond the nostrils are black, and the whole intervening portion of the upper mandible is leaden-blue; and between these two extremes the breadth of the blue band or bar varies."

"Length 18″ to 20·5″; expanse 29·4″ to 32·2″; wing 8·5″ to 8·5″; tail from vent 2·35″ to 3·2″; tarsus 1·4″ to 1·5″; bill from gape 2·15″ to 2·29″; weight 1 lb. 13 oz. to 2 lbs. 5 oz." (Hume).

Adult Female.—Forehead and crown dark brown, fading to dull fulvous-brown on the hind neck, sides of the head and neck, and thence to pale fulvous-grey, or greyish-white, on chin, throat and foreneck; back and scapulars greyish-brown, with greyish vermiculations mixed with black, the vermiculations varying very much in extent and being sometimes almost wanting; lower back, rump and upper-tail coverts blackish, the external feathers of the rump with a few fine white bars; tails and wings as in the male, but the latter much duller and less vermiculated; whole lower parts pale dull grey, tinged with rufous-brown on the breast and sides, and darker brown towards the vent and under-tail coverts.

Irides dull yellow, rarely brown; bill as in the male, but generally with the blue more restricted in extent and of a duller shade; legs and feet similar to those of the male, but duller on an average.

"Length 17·25″ to 18″; expanse 28·75″ to 31·5″; wing 7·9″ to 8·3″; tail from vent 2·2″ to 3·1″; tarsus 1·4″ to 1·5″; bill from gape 2″ to 2·19″; weight 1 lb. 5 oz. to 2 lbs. 4 oz." (Hume).

Young males resemble the females, but have the head much more reddish and also paler, and, according to Finn, are usually browner below.

"*The male in undress* retains much of his full colour, merely getting a browner head, a dark-pencilled grey breast and duller tail-coverts." (Finn, "*Asian.*")

"*Males in first nuptial dress* differ from the adults in having the chestnut of the head and neck paler, and the black of the breast and upper back replaced by dark-brown."

"*Young in down,* according to Naumann, are dark brown on the upper parts, shading into rusty-brown on the head and neck, underparts dirty yellowish-white; bill and feet light bluish; iris grey" (Salvadori).

The Pochard, Red-headed Pochard, or Dun-bird, as it is variously called, has a very wide distribution, practically throughout the Palæarctic region from Iceland to Japan. It breeds almost throughout the more northern portions of this area, but very rarely to the East, not at all to the extreme East, and it winters throughout Southern Europe and Asia and also in Northern Africa. Seebohm (" Birds of the Japanese Empire ") says : " The Pochard occurs both in Yezzo and the more southerly Japanese islands, but whether it be resident or only a winter resident there seems to be no evidence to determine."

Nyroca ferina is separated by Salvadori from the American forms to which the names *americana* and *vallisneria* are applied. Many ornithologists unite *americana* and *ferina*, and in this case the whole of North America must be added to its habitat ; and, consequently, also its breeding range would then become circumpolar with the exceptions already noted. The American bird is larger, has more and clearer blue on the bill, a purer white to the under-parts, and a purple gloss on the head and neck.

Finn in his popular article on ducks in the *Asian* thus defines its Indian area : " It visits Northern India in large numbers ; further South it is less common, but occurs as far as Bellary. It has not been obtained in Mysore or further South, nor in Ceylon ; but it is not uncommon in Assam and Manipur, and has recently been recorded from the neighbourhood of Mandalay."

It is probable that it visits North Burma and the independent Burmese States in considerable numbers, for it is common in Manipur, whence a large proportion migrates towards Burma, and not through Cachar and Sylhet.

I have had it now reported to me from Mysore, where, however, it would only appear to be met with on very rare occasions. Hume notes that it has not been recorded from Cachar or Sylhet, but it is fairly common in both districts.

From Kashmir it has also been recorded as forming an item in a large bag made by three guns in that State, and again in the *Asian* of the 8th of February, 1898, two Dun-birds are said to have formed part of a bag of 508 duck and teal shot by A. E. W. in the same State.

The Pochard is one of the later ducks to arrive in India. In its northern limits it is seen first in the latter half of October, but it does not, I think, extend South until well on into November. In Bengal to the East and South the *end* of November is as early as one may expect to get them in any numbers, though a few will always be seen in the beginning of that month—stragglers, perhaps even earlier. I should not, however, call it a very common duck anywhere to the East of the Bengal Presidency, and I remember when shooting in the Sunderbunds this Pochard was never in any but very small numbers, although the country all about there is so admirably suited to all its requirements.

As regards the flocks it collects in, this would seem to depend almost entirely on the country it visits and its accommodation in the way of water. Thus where there are huge jheels, morasses and lakes covered in part with jungle and in part having open expanses of water of some depth, free of vegetation of a heavy character, they will be found in thousands; elsewhere they will be found in small flocks, pairs and rarely single birds. There is practically no kind of water that they will not visit sometimes in greater or smaller numbers, but, preferentially, they leave alone shallow jheels and waters, and also such as have the vegetation everywhere very dense ; on the other hand, they do not care for *quite* open water without vegetation of any kind whatsoever.

Even as to this last, however, there is no absolutely fixed rule, for they sometimes visit the sea itself, keeping, as a rule, then to harbours, estuaries, &c. When shot in such places, they, like most other ducks got under the same circumstances, will be found to have a very rank and fishy taste, though, when shot inland on their more ordinary haunts, they are very uniformly excellent in flavour. Their bad flavour is, of course, due to their own food which, when they take to the seashore consists of tiny marine shell-fish, fishes, &c.; whereas, when in fresh water, their food consists mainly of a vegetable diet, though, like all ducks, they are more or less omnivorous.

A near relation to this bird is the famous canvas-back of America, so dear to the epicures of that continent, differing little from our bird in coloration, though it is rather larger and also slightly paler below. So close are the two birds in appearance, however, that, as Finn relates, a wretched poulterer in England, who had received, and was selling, a consignment of canvas-backs from America in ice, was prosecuted for selling pochards out of season. Most of us would probably think it was a very good thing, too, if such prosecutions helped to enforce a close time in America, as well as in England.

It is a fine, rapid and graceful swimmer, the water—not land or air—being its real element. Finn notes : " This Pochard swims particularly low in the water, and very much down by the stern." The notes of this ornithologist on duck habits and manners are in great part made not only from wild birds, viewed of necessity from some distance, but also from close observation of birds in captivity, and are, in consequence, worthy of careful attention.

They are, of course, like all other Pochards, wonderful divers, and the greater part of their food is obtained by diving ; but they will also dive and swim after one another in play, and Hume remarks that when thus playing they seem to sit far more lightly on the water than at other times.

Their powers of flight are not equal to those of swimming and diving ; once on the wing, they go away at a good pace, but they are slow off the water and awkward as well.

Hume noticed that when there is a wind, they always, if possible, rise against it. This is not, however, I think, typical any more of these ducks than it is of most, if not nearly all water-birds, as well as many land ones. In the old days, when adjutants were so common in Calcutta, one could, during the rains, watch one or more any day getting up off the *maidan* there, first expanding its huge wings and then going off in ungainly strides until the wind worked against and under its broad sails when a lusty kick or two shot it off the ground.

On land, too, Pochards are very clumsy and slow, though they can walk well enough when pushed to it.

Principally night-feeders, they also feed throughout the day, except in the hottest hours, where they are not interfered with. Hume once or twice caught them feeding on wild rice on land, but their feeding thus is, I should think, quite exceptional, and nearly all their diet is one obtained from fairly deep water amongst roots and similar things.

Normally they would appear to be neither very shy nor yet very tame, but it takes very little shooting to make them most decidedly the former ; and then, owing to their keeping so much to the centre of the water they frequent, they are by no means easy to get within shot of.

I do not remember ever to have heard the Pochard utter any sound other than that characterized by Hume and other writers as "*kurr-kurr.*" It is like that of the White-eye, but harsher and louder.

Lathom in his "Synopsis of Birds" says that it "has a hissing voice. The flight is rapid and strong: the flocks have no particular shape in flying, but are indiscriminate." This flying *en masse* and not in line or V-shape would appear to be typical of all the true Pochards.

The Pochard breeds extensively over Europe and even in Northern Africa, in Algiers. It has also been reported as breeding in Egypt, but probably by mistake. It also breeds in the western half of North-Central Asia.

They make their nest beside the water, generally right at the edge in amongst long grass, reeds or bushes, and sometimes actually in the water itself. Any piece of water would seem to serve the bird's purpose as long as there is sufficient cover—it requires this fairly thick and plentiful—nor would it seem to mind whether the water is fresh, salt, or brackish.

The nest itself is a very slight structure composed of the usual materials employed by ducks, *i.e.*, grass, rushes, weeds, &c.; when placed actually in the water, it is of necessity somewhat more bulky and better put together than at other times, but even then it is more flimsy and rough than that of most ducks.

When placed, as it often is, in some hollow or depression of the ground, or amongst roots, &c., it consists merely of a couple of handfuls of materials lined with feathers and down.

Morris says: "The nest of the Pochard is made among rushes or other coarse herbage, and is lined with feathers. Many nests are placed near each other, in suitable localities, such as osier beds or grassy places."

"The eggs are from eight or ten to twelve or thirteen in number and of a buff-white colour."

Dr. Leverkuhn sends me the following interesting note from Sophia, which confirms what other observers have said as to the high qualities of the Pochard as a mother:—"*Nyroca ferina* is a regular breeder in different lakes in Germany, where I have sometimes taken its nest, and I also ascertained the fact of its breeding on a swampy lake near Varna. The female shows great anxiety concerning the safety of her eggs, and covers the clutch before leaving with some feathers from the bottom of the nest. I found eight and ten eggs in a nest."

Hume describes the eggs thus:—"The eggs are very regular, broad ovals; the shell smooth, but dull and glossless. In colour they are a pale, dingy, greenish-drab, more or less, in most cases, tinged with yellow. They average about 2·4 in length by 1·7 in breadth."

The eggs in my collection are dull, rather dark, brownish-drab, but have little or no trace of either green or yellow in them, though they may have had when fresh. In shape and texture they agree with Hume's description, but one egg has a decided, though faint, gloss. My eggs average about 2·25″ by 1·7″. As with other Pochards' eggs, they have a rather fragile shell.

32. NYROCA BAERI.

The Eastern White-eye.

Fuligula baeri, Finn, P. A. S. B., 96, p. 61 ; *ibid*, Jour., A. S. B., LXVI, pt. 2, p. 525 ; *ibid*, " Indian Ducks," *Asian*, 1899.

Nyroca baeri, Salvadori, Cat., " Birds of British Museum " XXVII, p. 344 ; Blanford, " Avifauna of British India," IV, p. 461.

Description : Adult Male.—A large spot at the angle of the chin, pure white ; the remainder of the head and neck black, glossed with green ; breast rufous-chestnut, that colour merging into the black of the head, but sharply defined from the white of the abdomen and under-tail coverts ; the feathers of the vent brownish at the base; flanks rufous-brown ; upper parts dark brown ; the scapulars and interscapulars very finely covered with narrow bars of lighter brown ; rump and upper-tail coverts brownish-black, a few of the feathers at the side finely vermiculated with white ; tail brown ; wing coverts dark brown, the outer secondaries white, with a broad subterminal black band ; quills brown, the inner webs of the primaries greyish-brown ; the inner secondaries very dark brown, in good specimens very narrowly margined black on nearly the whole of the outer web and glossed with olive-green.

Bill dull slate-blue, the basal third, tip and nail nearly black ; irides white ; legs and feet greyish-lead, joints and webs darker.

" Feet lead-grey, with the joints darker ; irides white or pale yellow " (Salvadori).

Length 18″ to 20″ ; wing 8·2″ to 9·5″ ; bill from point of forehead 1·75″, from extreme base 2·2″, from gape 2·1″, breadth at base ·73″ and at broadest part ·86″ ; tarsus 1·4″.

Adult Female.—Like the male, but the head is blackish-brown, unglossed with green, and has the anterior part rufous ; the spot on the chin appears to be smaller, and the throat and lower part of the neck are more rufescent and paler; the whole tone of the bird is duller, and the definition between the breast and abdomen is blurred and indistinct, whilst the abdomen itself appears to be a sullied, not pure, white.

Irides grey or brown, perhaps white in very old females; bill and feet as in the male, but still duller.

"The eyes of the female are brown, rarely grey or whitish" (Finn).

Length about 16″; wing about 7·5″; tail 2·3″; bill from point of forehead 1·7″, from extreme base 1·98″, from gape 1·9″, in breadth at base ·61″ and at widest part ·85″; tarsus about 1·4″.

"The female is smaller than the male, especially about the bill, but females in this species appear to vary in size much more than the males, and, as in the Tufted Pochard, some are much duller and less like the male than others" (Finn).

A young male in my possession has the whole head mottled brown and black, the new black feathers showing the sheen of the usual green gloss, the breast is a queer mixture of dirty yellowish-brown and the deep rufous or bay of the adult bird; the lower abdomen and vent is mixed brown and white.

Another young male exactly answers to the description above given for the female but that the definition between breast and abdomen is very sharp, and the olive gloss on the wing is highly developed.

Baer's Pochard is the Eastern form of the common White-eyed Pochard, to which it is very closely allied, yet, as far as fully adult birds are concerned, from which it is very easily distinguishable. It would appear to average a much heavier, bulkier bird, and all the birds in my collection, amongst them two received from Mr. Finn, have proportionately the bill much larger, both longer and wider. Neither Blanford, Salvadori or any one else, as far as I can gather, seems to have noticed this; but to me, when specimens of the two species lie side by side, this vast difference in the bills is what would first draw attention.

Of course, my series is a very small one, and it is quite possible that large series *might* show intermediate sizes in both species.

Its range extends, according to Salvadori, from Kamtschatka to Shanghai and Japan, descending South in winter into India, and almost certainly into South China and Burma.

Mr. F. Finn, who has kindly given me *carte blanche* to use his notes, thus sums up the records of its appearance in India :—

" It was apparently obtained in Bengal in 1825, and Blyth, certainly, got one female in the Calcutta bazaar in 1842 or 1843, but did not identify it, which is not surprising, seeing that it had not been recognized as a species. Then at the end of February, 1896, I got eleven full-plumaged birds, and since then the species has come in greater or less numbers every cold weather. I have got three males and a female this month (the former from a dealer), and saw what was either a small dull female or a hybrid with the common white-eye about the middle of January. We have other birds in plumage intermediate between the White-eyes, and I, therefore, now think that they interbreed."

It seems probable from Mr. Finn's observations in Calcutta that the Eastern White-eye will prove to be a regular and not uncommon visitor to the north-eastern parts of India and, almost equally surely, to Northern Burma. My own collectors on two occasions obtained a young male in Cachar ; they seemed to know the bird, and called it the "boro lalbigra" or " Larger White-eye." When questioned, they said it was a rare, but regular, visitor to Cachar and a more common one in Sylhet, whence they offered to procure me specimens.*

Again, indenting on Finn, I quote from the *Asian*:—"No one seems to have had much opportunity of observing this duck in a wild state, and my own observations have been restricted to captives. It is a better walker than most Pochards, and I have fancied, hardly so fine a diver. It certainly, judging from the birds in the fine water-aviary in the Alipore Zoological Gardens, rises more easily on the wing, and flies with less effort than other Pochards. I notice that at Alipore our birds can rise well up into the roof, and fly round and round like the surface-feeding ducks. The species appear to stand the heat less well than the Common White-eye, and probably breeds in a higher latitude. I am ashamed to say that, having had more to do with this species than any one, I do not know how it tastes."

I ate part of the flesh of one of my birds, and it was not at all good, not good enough to finish even.

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* Mr. Finn does *not* think that Baer's Pochard has been a common form, merely overlooked. Certainly, as he says to me *in epistola,* Baer's Pochard when adult cannot well be mistaken for the Common White-eye. Blyth's bird was a young female and therefore, of course, very much like a Common White-eye. It may be therefore that there is just a temporary, unaccountable rush of this species to India, and that it will again cease.

I remember some eight or nine years ago Mr. J. Kennedy, then Deputy Commissioner, Cachar, shot a White-eye up in the North Cachar Hills, which aroused my interest from its great weight and very dark, glossy head. I was not then at all interested in ducks, except when on the table, and put the bird down as an abnormally coloured and very large common White-eye ; but now I have no doubt that it was a good specimen of the Eastern White-eye.

This bird was one of a flock of about a dozen or less, which we sighted flying up-stream on the river Diyung, a mountain stream, consisting of rushing rapids and deep, still pools of water in alternation. We followed them up and found the birds in a deep, but very rapid narrow, which in one place widened out and made an eddying pool on either side, in which the ducks were swimming.

On our approach they got up, but Mr. Kennedy fired and knocked one over ; it was only winged and fell into the torrent, leading us a pretty dance before we eventually secured it. The great pace of the water seemed to have no appreciable effect on it, either in diving or swimming, for it dashed backwards and forwards with the greatest ease, kept long under water, and turned and twisted with great agility. At last a snap-shot, as it showed itself for a moment, brought it to hand.

I remember this duck, though it must have been a very fully adult male, had bright pale yellow irides. The bird was so rank and fishy that we could not stand it on the table.

Two of my collectors (Mahomedans) who have lived all their lives in Cachar and Sylhet, say that this White-eye is a faster, stronger bird on the wing than the common White-eye, an equally good diver and swimmer and much more shy and wary.

Seebohm in his " Birds of the Japanese Empire" says that " the Siberian White-eyed duck breeds in the valley of the Amoor." This is the only note of its breeding which I can find.

It is probable that in nidification it will differ in no way from the common White-eye, though we may expect to find its eggs to average somewhat larger.

33. NYROCA AFRICANA.

The White-eyed Pochard or White-eye.

Aythya nyroca, Jerdon, " Birds of India," III, p. 813 ; Hume, " Nests and Eggs," p. 645 ; *ibid*, " Str. Feath.," I, p. 265 ; Adam, *ibid*

p. 402; Butler, *ibid*, IV, p. 30; V, p. 234; Davids. and Wend., *ibid*, VII, p. 93; Ball, *ibid*, p. 232.

Fuligula nyroca, Hume, "Str. Feath.," VII, p. 493; *ibid*, Cat., No. 969; Scully, "Str. Feath," VIII, p. 363; Hume and Mars., "Game Birds," III, p. 263; Vidal, "Str. Feath," IX, p. 93; Hume, *ibid*, p. 259; Butler, *ibid*, p. 439; Reid, *ibid*, X, p. 84; Davidson, *ibid*, p. 326; Taylor, *ibid*, pp. 528, 531; Oates, "Birds of British Burmah," II, p. 287; *ibid*, "Nests and Eggs" (2nd edition), III, p. 292; Barnes, "Birds of Bombay," p. 413; Hume, "Str. Feath.," XI, p. 347.

Nyroca ferruginea, Blanford, "Avifauna of B. India," IV, p. 460.

Nyroca africana, Salvadori, Cat., "Birds of British Museum," XXVII, p. 345.

Description: *Male.*—Whole head, neck and breast rich rufous or bay-brown, the nape somewhat darker, a dark collar of brownish-black round the neck and thence behind to the back the same colour, a small white spot on the chin, whole upper parts dark blackish-brown or dull black, the feathers of the scapulars and upper back more or less vermiculated with rufous, the vermiculations often almost entirely absent; wings as in *N. baeri*, but are said, as a rule, to have the white purer. I have, however, specimens of both species quite inseparable in this respect. Lower plumage the same as in *N. baeri*. Iride white; bill dull slatey; legs dull dark slate, tinged either with grey or green; and sometimes mottled about the joints.

Length about 17″; wing 7·1″; tail 3·3″; tarsus 1·2″; bill from front 1·56″, from extreme base 1·96″; width at front ·78″ and at base ·64″.

"Length 16″ to 17·1″; expanse 24·5″ to 27·3″; wing 6·8″ to 7·45″; tail from vent 3·1″ to 3·5″; tarsus 1·1″ to 1·3″; bill from gape 1·9″ to 2·1″; weight 1 lb. 2 ozs. to 1 lb. 9 ozs."

"The bill is black, bluish-black and dark leaden, often browner below; the irides white or greyish-white; the legs and toes slate-colour, leaden or dusky-grey; the tarsi often with a greenish tinge; the claws and webs dusky to black" (Hume).

Adult Female.—Similar to the male, but with the whole plumage duller, the head and breast more brown than rufous and ill-defined from the abdomen, which is itself much sullied, except in very old females.

Length about 16″, wing about 7″, tail about 3·3″, bill generally rather smaller than that of the male, but sometimes reaching the full dimensions given above.

Legs, feet and bill as in the male; irides, grey or brownish-grey, sometimes white in very old females.

"Length 15·9″ to 16·5″; expanse 24″ to 26·5″; wing 6·8″ to 7·4″: tail from vent 3″ to 3·4″; tarsus 1″ to 1·25″; bill from gape 1·9″ to 2·5″; weight 1 lb. 3 ozs. to 1 lb. 6 ozs." (Hume.)

Young Male.—Similar to the female, but with the whole head and breast much suffused with ochraceous, and the centre of the abdomen with the broad brown bases to the feathers showing prominently; the back is lighter also than in the old females, with the pale borders to the feathers well defined.

Scully, quoted by Hume, thus describes two young birds:—

"♂ *Juv. 30th July.*—Length 16·1″; expanse 21″; wing 5·1″; tail 2·4″; tarsus 1·1″; bill from gape 1·75″; weight 15·5 ozs.; bill dusky, livid below; irides dark brown; legs and feet mottled dusky; claws black."

"♀ *Juv. 18th July.*—Length 15·7″; expanse 26·2″; wing 7·5″; tail 2·1″; tarsus 1·2″; bill from gape 1·9″; weight 15·4 ozs.; bill black above, grey-slatey below; irides brownish-grey; legs and toes dusky plumbeous; webs greyish-black; claws black."

"*Young in first plumage.*—Head and neck brown, with scarcely a chestnut tinge on the sides of the head; breast and under-parts brown, paler, almost whitish, on the abdomen; under-tail coverts dull whitish" (Salvadori).

"*Young in down* are dark brown on the upper parts, with pale spot on wings and scapulars; under parts buff, shading into brown on the flanks" (Seebohm).

Salvadori thus defines the limits of the White-eye:—"Western palæarctic region, as far East as the valley of the Obb; breeds in the basin of the Mediterranean, in Central and Eastern Europe, and in Western Asia as far as Kashmir; in winter it extends in Africa as far South as the Canaries on the West and Abyssinia on the East, in Asia as far South as India and Arrakan."

In India the White-eye is extremely common over the whole of the northern portion, though it becomes less so to the East of longitude 9°, being still found, however, in considerable numbers throughout Assam, Manipur, Cachar, Sylhet, Chittagong and Southern Burma.

As it wanders South, it appears to get more and more rare; but it is not easy to trace its extreme southern limit. To the extreme West Vidal got it at a place called Khed, in Ratnagiri, about latitude 17°-4′. Mr. P. M. Allen records having shot a pair of White-eyes in the Nizam's territory at Nalgonda, latitude 17°-22′. Then to the East coast Hume says, "I have failed to trace it; it is not recorded from . . . one of the Madras districts south of Mysore and the town of Madras." This would infer that he has had records of it as far South as Madras, but I cannot find any traces of them. In Burma it has only been recorded as far South as Arrakan.

The kind of water preferred by the Pochard is that also which forms the favourite resorts of the White-eyed Pochard. I have, however, found them in all and any sort of water. Wandering up and down the hill streams, clear deep pools and rushing torrents of shallow water following one another in rapid succession, I have often disturbed small flocks of the White-eye, and I have equally often found a pair or a small flock in the very dirtiest and smallest pools of stagnant water.

Where there are wide stretches of water, clear here and there in patches, but for the most part covered with water-plant and with shores thickly lined with reeds, &c., the White-eye assembles in vast numbers, but not in very large flocks. These (the flocks) may number anything between half-a-dozen and over fifty, but even of the latter number there will be but few. Then, again, the birds lie so scattered and far apart that they keep rising in ones and twos, giving the impression that they are only consorting in pairs or a very small flock and, of course, many single birds and pairs are really met with.

As showing the numbers in which these ducks are found in suitable localities, it is worth notice that, in the *Asian*, a bag of ducks was recorded as having been shot in Chapra, which contained 385 duck; but out of this no less than 187 were White-eyes.

No doubt, their manner of rising is a very admirable trait for any duck to possess, and the White-eye has other good points as well. As a rule, it is a decidedly tame bird, still lingering in amongst the reeds and other jungle long after nearly all other ducks have left, rising well within shot when disturbed and often not going far before again seeking the water. It gets off the water badly, fluttering about and rising very obliquely; nor does it rise high when well on the wing, but generally flies within a few yards of the surface of the water, getting on considerable pace when once fairly away. It requires straight shooting to kill outright, for it is a hardy, close-plumaged little bird, and will take a lot of shot. Hit, but not killed, it is very far from caught, for it is a wonderful diver ; quick and strong under water, it makes for the dense undergrowth *in* the water, where it hides, or, if dropped in the open, dives for such long periods and goes so far and fast that the gunner never knows where to expect it and when he may get his second barrel into it. All his good qualities are, however, quite over-shadowed by the fact that when shot and caught it is no longer worth anything, for so rank and coarse is the flesh that it is quite uneatable. The condemnation of the White-eye as an article of food is not, however, universal ; thus Colonel Irby speaks of the bird as found in Spain: "Its flesh is not only like that of the Red-headed and Red-crested Pochards, excellent eating, but far surpasses either in that respect." Even here in India Captain Baldwin once wrote :—"It is only a tolerable bird for the table." But Mr. F. Finn goes one better than tolerable, and writes in the *Asian* :—"It is said to be very poor eating, but I have found it to be palatable enough." Tastes differ, however, and there may be others to agree with Messrs. Finn and Baldwin, but personally I have found them unpalatable in the extreme, fishy, oily and rank.

Omnivorous like all ducks, this species probably makes its diet fully three-quarters animal. Those birds which I shot in the Diyang and other hill streams had all, in addition to the caddis-grubs, dragon-fly larvæ and similar articles, quite a number of small fish, some of them 3″ in length. These were all or nearly all, of the small "Millers' thumb" species so common in every hill stream. Doubtless, these from their sluggish disposition and their ostrich-like habit of hiding their heads under a stone and then resting in fancied security, fell a very easy prey to the active White-eye.

On land this little Pochard is quite out of his element ; he can walk all right and get along well enough for purposes of slow progression, but he is very awkward and shuffling in his movements and incapable of any appreciable increase in the speed of them even under the impulse of fear.

It is, on the whole, a very silent bird. Hume says that "their quack or note is peculiar, though something like that of the pochard, a harsh 'koor, kirr, kirr,' with which one soon becomes acquainted as they invariably utter it 'stuccato' as they bustle up from the rushes, often within a few yards of the boat."

It is in reference to this bird and Captain Baldwin's note on the frequency he has shot it without any feet, not without one only but without either, that Hume raises the point as to how their feet have been lost, &c., and says that he himself has killed more than fifty birds thus maimed. Frost bite he dismisses from the list of probable causes, and in this most of us will join him ; but what then is the cause ? Crocodiles would not, as a rule, take a foot at a time ; traps are shown to be very unlikely agents, and one is thrown back on the fish theory. This is an extremely likely one, for I have myself known domestic ducks to lose their limbs from the attacks of a huge pike ; indeed, when the birds were young and weak, they often lost not their feet only, but their lives also. Ducklings constantly disappeared in this manner. As there are many other fish quite as voracious as the pike in other climates, this would account very reasonably for so many birds losing one or more limbs.

This is one of the very few migratory ducks which breed regularly within our limits. As to its breeding in the plains Hume writes :—" The White-eye breeds possibly in some localities in the plains of India and in Sind, where it swarms during the cold weather, and where I was informed that in some broads it remains during the whole year. I have never, however, succeeded in finding a nest, or obtaining any reliable information as to one being found in the plains."

This was written more than eighteen years ago, and the reliable information is still wanting, so that it is only fair to presume that the duck does *not* breed in the plains.

In Kashmir it breeds regularly and in very great numbers, so large, indeed, that the collecting of the eggs and bringing them into Sirinagar by boats for sale, forms a regular and profitable profession with a number of the people living in the vicinity of their favourite breeding haunts.

The nest is an ordinary structure of fair dimensions, made in the usual duck fashion of reeds, grasses, &c., and is, in India at least, nearly always placed either very close to the water or in the water itself amongst the vegetation growing in the shallows. Inside the nest there are, of course, feathers and down in greater or smaller amounts, frequently not much; but, in addition to this, there appears generally to be a sort of subsidiary lining composed of finer grasses and weeds than are used in the body of the nest. This characteristic of the nest is rather marked in contrast to the majority of other ducks' nests, but it is well authenticated and worthy of notice.

Where the birds are most numerous, several nests may be found in close proximity to one another; and as the birds are close sitters, finding them is a matter of little difficulty.

In Kashmir the first few birds breed in the end of April, but not many till the beginning of June, and it is in this month that the regular trade in their eggs commences. They appear to lay from six to ten eggs, possibly one or two more occasionally; but such occasions cannot be frequent, as Hume's collectors never succeeded in finding more than ten.

In the basin of the Mediterranean they would seem sometimes to place their nests in cover some little distance from the water, for Lord Lilford who found their nests in Southern Spain writes:—"We obtained a nest of nine eggs, from which I shot the female bird. The nest was at a short distance from the water, in high rushes, and was composed of dead, dry-water plants, flags, &c., and lined with thick brownish-white down, and a few white feathers."

In Europe also it is said to sometimes lay twelve eggs, and I have one record from Turkey of fourteen eggs having been laid in a nest. This nest also, I may add, was placed a considerable distance from water, in amongst bushes.

The colour of the egg varies from pale drab to a quite deep *café au lait*, the latter colour being unusual. In a few eggs there is a faint yellow or greenish tinge, but the greatly predominating tint is a brown or *café au lait*, and nine out of ten will be found to be of this.

The shape is, as a rule, rather a long oval, very regular, and they vary but little. Hume says:—"They are commonly very regular and perfect ovals, moderately broad as a rule, but occasionally considerably elongated and slightly compressed towards one end." In my small series I have no eggs thus compressed; all are just about the same at either end.

The texture is fine and close, but distinctly more porous than the average duck's egg; and the eggs, in consequence, are very liable to discoloration. The surface is smooth, but has no gloss.

Hume's eggs varied in length between 1·9″ and 2·2″ and in breadth between 1·4″ and 1·54″. I have two eggs 2·25″ long, but in all others both breadth and length come within these extremes; on the other hand, whereas Hume's series averaged 2·1″ by 1·49″, mine average 2·12″ by 1·45″ showing them, as I have already said, to be rather narrower and long proportionately.

(*To be continued.*)

THE FERNS OF NORTH-WESTERN INDIA,

Including AFGHANISTAN, the TRANS-INDUS PROTECTED STATES, and KASHMIR:
arranged and named on the basis of Hooker and Baker's *Synopsis Filicum,*
and other works, with New Species added.

THE FERNS OF NORTH-WESTERN INDIA.

Corrections in third instalment, published in Vol. XII.

On p. 621, line 7—for "Part III," read "Part II concluded"

In 14th line of p. 621, after "pair," insert "of segments."

On p. 622, 3rd line—for "chesnut, coloured," read "chesnut-coloured."

On p. 622, 5th line—for "elliptic, oblong," read "elliptic-oblong."

On p. 622, 8th line, for "μ" read "n."

On p. 622, 12th line, insert a space between "55" and "Plate X"—Plate X is mine in this paper, not Beddome's.

On p. 622, in last line of small print, "Hopeh" should (I think) be "Hupeh."

On p. 622, 17th line from bottom, after "average," insert "frond."

On p. 623, in 2nd line from top, the letter "o" has dropped from the word "Beddome."

On p. 624, in 6th line, at beginning of the parenthesis, insert—"A. Braun sub *Aspidium.*"

On p. 625, 13th line from bottom, insert "(*N. nemorale*)" after "species."

On p. 627, 9th line, the semicolon after "speak" should be a "comma."

On p. 628, in 10th line from bottom, "Subgems" should be "Subgenus."

On p. 630, in 9th line from bottom, delete the comma after "species."

C. W. HOPE.

segments are not nearly so much incised as those of the last mentioned plant—merely shortly toothed ; the stipes are shorter and not so thick, though stiffer ; and the rhachises are inconspicuous below, contrasting with the dark-coloured secondary rhachises of *N. serrato-dentatum.* The pinnæ are blunter, and are never nearly bipinnate ; and the venation is not so distinct.

The serial numbers prefixed to the New Species show their place under each genus in the General List (Part III), where the names only will be repeated.

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By C. W. HOPE.

(*Continued from page* 538).

PART III.

NEW SPECIES.

11. Nephrodium Kingii, n. sp.—*Plants* isolated ? ; *caud.* erect? ; *st.* short—about quarter the length of the frond, clothed with dark brown acuminate hair-pointed scales, truncated at base ; *fr.* small—6—10 inches 1, 2—3 inches br., lanceolate-acuminate, rhachises clothed with scales similar to those on stipes, but smaller ; *pinn.* up to about 18 pairs, subdeltoid, but with the inferior of the lowest pair generally rather the shorter, almost sessile, and decumbent on the main rhachis, gradually narrowing to a not acuminate apex, cut down to a broadly winged rhachis into upwards of 10 distinct rectangular bluntly-rounded segments, which are toothed round the apex and lobed on both sides—the lobes more or less toothed according to size of plant ; *texture* herbaceous ; *ven.* pinnate in the segments, veinlets in triplets in the lobes and running into the teeth ; *sori* small, subcostal, one to each lobe on the lower veinlet ; *invol.* entire or irregularly lacerate, not fimbriate, persistent. (PLATE IX.)

PANJAB : *Chamba*—.—Ravi Valley, below Salrundi 95-10,000′, McDonell 1882 ; Chenab Valley—Cheni Pass (Pangi side 10,000′, McDonell : in Herb.-Hort. Calc. *Simla Reg.*—above Simla, Colonel Bates. N.-W.P.: *T. Garh.*—moraine of Dudu Glacier under Srikanta 14-15,000′, Duthie 1883, Nos. 386 and 394.

DISTRIB.—*Asia* : N. E. Ind. (Him.) Sikkim, Lachen 11-12,000′, *Hooker K.* 1849 ; Sundukphoo 92,000′, *Levinge* 1880 ; Jongri 13,000′, *Gammie* 1892, No. 187 ; Thibet—Dungboo, and Do-tho, King's Collector 1877, No. 4693.

This elegant little plant was, if I remember rightly, put up by Mr. McDonell among specimens which he sent me of my next species—*N. serrato-dentatum* ; and specimens sent by him to Gamble were named by Levinge *N. Filix-mas,* near *odontoloma* (meaning, I believe, *N. serrato-dentatum*). The segments are not nearly so much incised as those of the last mentioned plant—merely shortly toothed ; the stipes are shorter and not so thick, though stiffer ; and the rhachises are inconspicuous below, contrasting with the dark-coloured secondary rhachises of *N. serrato-dentatum.* The pinnæ are blunter, and are never nearly bipinnate ; and the venation is not so distinct.

The serial numbers prefixed to the New Species show their place under each genus in the General List (Part III), where the names only will be repeated.

12. **Nephrodium serrato-dentatum,** n. sp.—*Plants* isolated; *caud.* erect ; *st.* in a dense tuft which attains 1½ in. diam. ; " Stipes 6 in., soft, thick, chesnut, coloured, with scattered, deciduous, lax, lanceolate, black pales ; frond 10 by 6—8 in., oblong-lanceolate, truncate at the base ; pinnæ often widened at the base—2-pinnate ; secondary pinnæ elliptic, oblong, obtuse, pinnatifid (sometimes deeply) ; segments rounded, sharply serrate ; texture thin, becoming hyaline towards the margin ; venation sub-flabellate ; involucre fimbriate." *Lastrea Filix-mas var.* μ, *odontoloma,* Moore, Bedd. F. B. I., Suppt. t. 373. ; *Nephrodium Filix-mas, var. odontoloma* (Bedd.), Syn. Fil. (2nd Ed.), 498 ; *N. odontoloma,* Hook. and Baker, C. R. 521. *Lastrea odontoloma* (Moore), Bedd. H. B. 248. *Lastrea Filix-mas, var. serrato-dentata,* Bedd. Suppt. H. B. 55. (Plate X.)

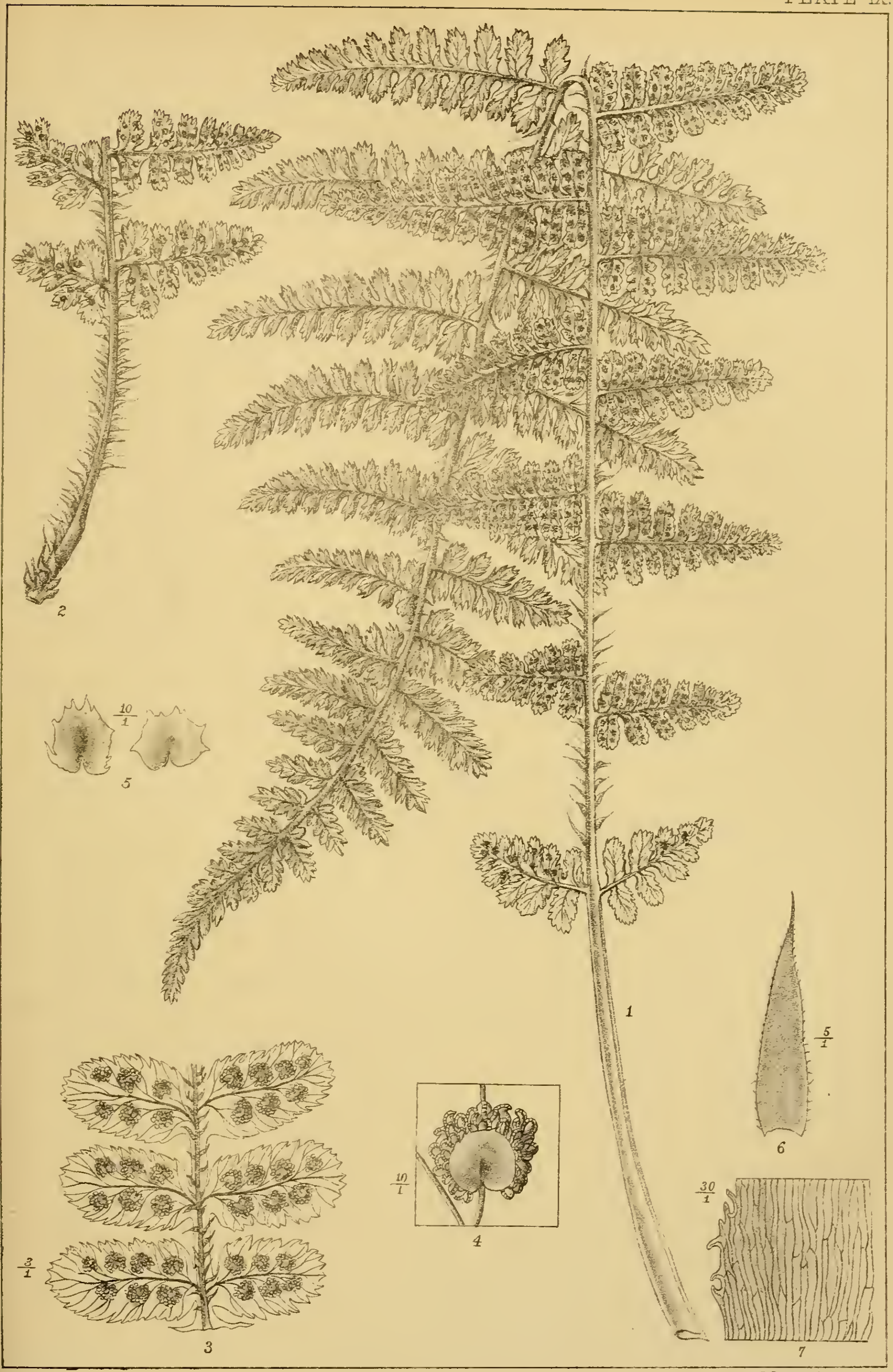
KASHMIR : *Liddar Valley.*—Chatponsal Nála 12-13,000′, Duthie 1893, No. 13221 ; *Sind Valley*, near Bàltal, 10-11,000′, Duthie 1892, No. 11613 (probably so).

PUNJAB : *Chamba*—Ravi Valley—Salrundi 11,000′, and Chenab Valley—Cheni Pass, McDonell 1882.

N.-W. P. : *T. Garh.*—Gangotri 12-13,000′, Duthie 1881 ; Damdar Valley 11-12,000′, moraine of Dudu Glacier, under Srikanta Mt. 14-15,000′ ; Gambar Pass 11-12,000′, Duthic 1883. *B. Garh.*, above Bhawani 13-14,000′, Duthie 1885. *Kumaun*—Pinsara Pass 10,000′, Davidson 1875 ; Rálam Valley 11-13,000′, Duthie 1884 ; Byáns—Pálang Gádh 11,000′, Duthie 1886.

DISTRIB.—*Asia* : N. E. Ind. (Him.).—Sikkim and Bhotan 11-16,000′, " common" (*Clarke in Rev.*)—China—Hopeh Prov., *Dr. Henry* 1889.

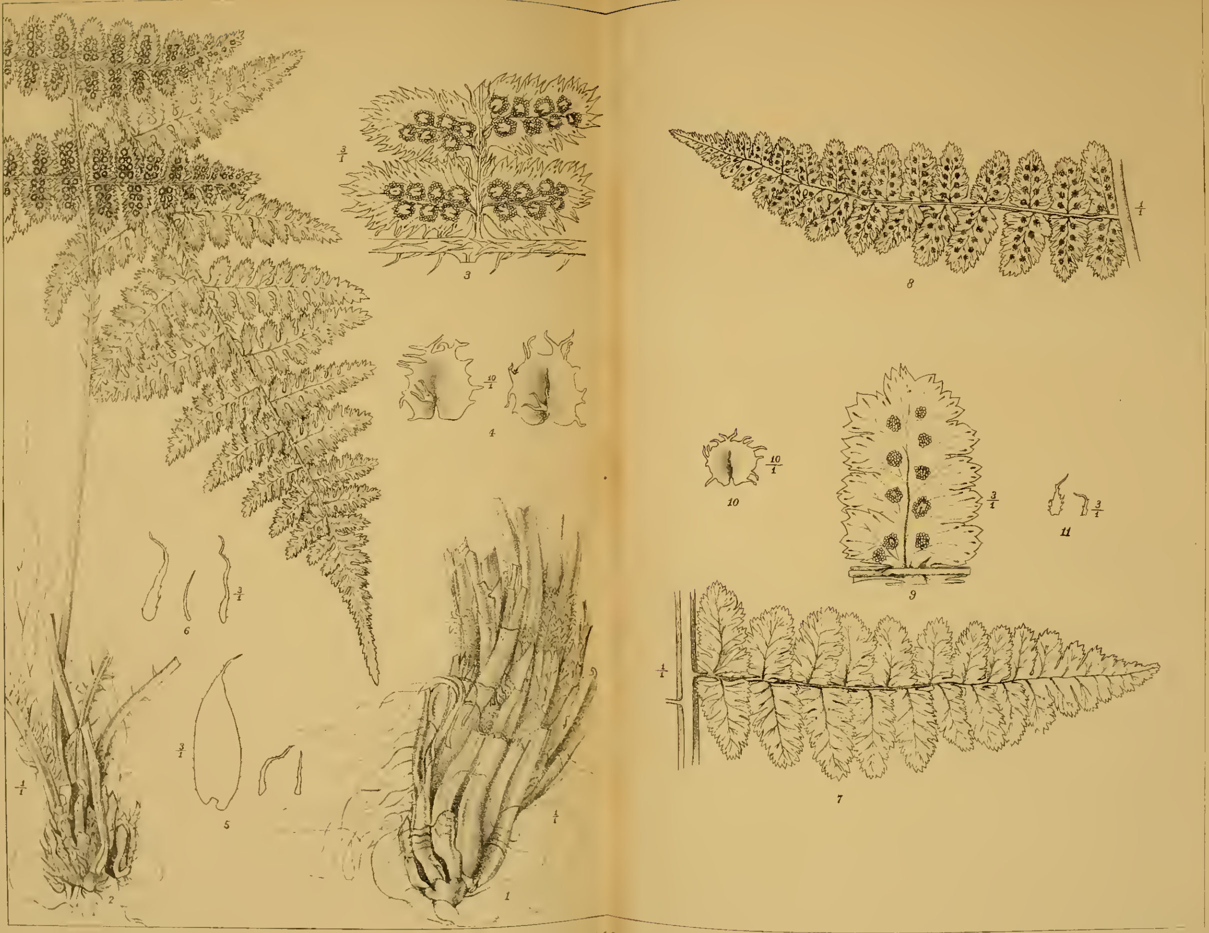
The quoted part of the description given above is Mr. Clarke's, representing, as he says, the fairly developed average, though he had examples much larger. The plate in Beddome's Suppt. to F. B. I., t. 373, was, Mr. Clarke says, drawn from a high-level scrap, and the description in the *Synopsis*, 2nd Ed. p. 498, seems to have been written from that scrap, which is even more unlike *N. F.-mas.* than are the fairly developed fronds which Mr. Clarke afterwards (?) contributed to the Kew Herbarium, some of which run to fully 13 inches in length ; 6—7 inches is, however, the greatest breadth I see there. I have incomplete fronds collected by Dr. T. Thomson in Sikkim (?) which measure 16—17 in. l., but they are not more than 6—7 in. br. These and some smaller fronds were named by Dr. Thomson (?) *Nephrodium Brunonianum var.*, but are unlike that species. I would modify Mr. Clarke's description by saying that the pales are dark to pale chestnut ; that the segments are not serrate—only toothed so as to enclose the veinlets ; that the venation is very distinct ; that the sori are one to each of several of the lower lobes of the segments or pinnules, placed near the costa. Also that the secondary pinnæ are never stalked, but have a broad base getting narrower near the main rhachis. The upper half or more of each pinnæ is only bipinnatifid. Many small,



N. E. Brown del. A. C. Mukerjei lith.

NEPHRODIUM KINGII, n. sp.

1. Frond, natural size.
2. Base of another frond, natural size.
3. Base of a pinna, × 3.
4. Sorus with indusium, × 10.
5. Two indusia, × 10.
6. Scale from the stipe, × 5.
7. Part of a scale from the stipe, × 30.



N. E. Brown & A. L. Singh del.

A. C. Mukerjei lith.

NEPHRODIUM SERRATO-DENTATUM. n. sp.

1. Rhizome of a large plant, natural size.
2. Portion of a small plant, natural size.
3. Basal part of a pinna of another frond underside, × 3 diam.
4. Two indusia, × 10
5. Scales from the base of the stipes, × 3 diam
6. Scales from upper part of the stipe and frond × 3 diam.
7. Lower barren pinna from a large frond, upper side, natural size.
8. Fertile pinna from the same frond, underside, natural size.
9. Pinnule, × 3 diam.
10. Indusium, × 10 diam
11. Scales from middle part of the frond, × 3 diam.

young (?) fronds are not even deeply pinnatifid, *e.g.*, the frond figured by Beddome.

In his Handbook Colonel Beddome followed Mr. Clarke and separated this fern from *N. Filix-mas*. Mr. Clarke did not think it ran into any form of *N. F.-mas*, and pointed out that the venation was very unlike the forked venation of that species. But Colonel Beddome, in his latest Supplement, says—"This is certainly only a variety of *Filix-mas*." As no reasons are given for this ruling, and as it is against the evidence of my senses, I must consider it as an *obiter dictum*, and decline to be bound by it. In a preliminary list, drawn up in 1891, but not published, I re-named this fern as *Nephrodium incisum*; but I must now adopt Beddome's specific name.

15. **Nephrodium pandum**, n. sp.—"Stipes round, firm" (long: sometimes longer than the frond); "frond nearly glabrous beneath, the main rhachis with a few ovate scales; frond narrowly oblong, the lowest pair of pinnæ but one often as long as any above, the lowest pinnæ usually but little shorter; pinnæ pinnatifid $\frac{1}{3}$—$\frac{2}{3}$ the way to the midrib; segments subspinulose, serrulate." *N. Filix-mas*, Richd., var. 1 *panda*, C. B. Clarke." Plate 68, C. R. 519, fig. 1. *Lastrea Filix-mas*, var. *panda*, Bedd. H. B. 251, and Suppt., p. 56.

PUNJAB: *Kangra Valley Dist.*—Dharmsala 10-11,000′, C. B. Clarke. N.-W. P.: *T. Garh.*—Kidarkanta Mt. 8000′, Herschel 1879; Ganges Valley, above Jhàla 11-12,000′, Duthie 1881. *Brit. Garh.*—East of Dhakwáni 11-12,000′, Duthie 1885. *Kumaun*—Gori Valley between Paton and Saba 7-8000′, Duthie 1884.

DISTRIB.—N. E. Ind. (Him.).—Sikkim 9-10,000′, *J. D. Hooker*.

Mr. Clarke says—"Some of the European *var. cristata* approach this." It does not appear whether he refers to the cultural variety of *N. F.-mas*, or to *N. cristatum*, Michx. Beddome's first thought was—"This has much the aspect of *odontoloma*" (meaning, evidently, *L. odontoloma*, Moore), "and it will probably prove to be a luxuriant form of that plant." His second thought expressed in the Supplement of 1892, was—"There are specimens at Kew which are intermediate between this variety and *Schimperiana*." Second thoughts are proverbially the best. I can find no good distinction between *N. pandum* and *N. Schimperianum*, and retain *N. pandum* chiefly out of deference to Mr. Clarke who has gathered both plants. I have not gathered the first named. *N. pandum* might be called a long-stiped and comparatively glabrous form of the Indian plant which is called *N. Schimperianum*, Hochst., and Mr. Clarke says that the less compound forms of var. *Schimperiana* run near var. 1 *panda*. Perhaps the best reason for retaining *N. pandum* as a species is that it is more unlike *N. Filix-mas* than *N. Schimperianum* is. Mr. Bliss's specimen of the last-mentioned fern, from below Haripur, near Simla, at a low level I think, might almost be transferred to *N. pandum.*

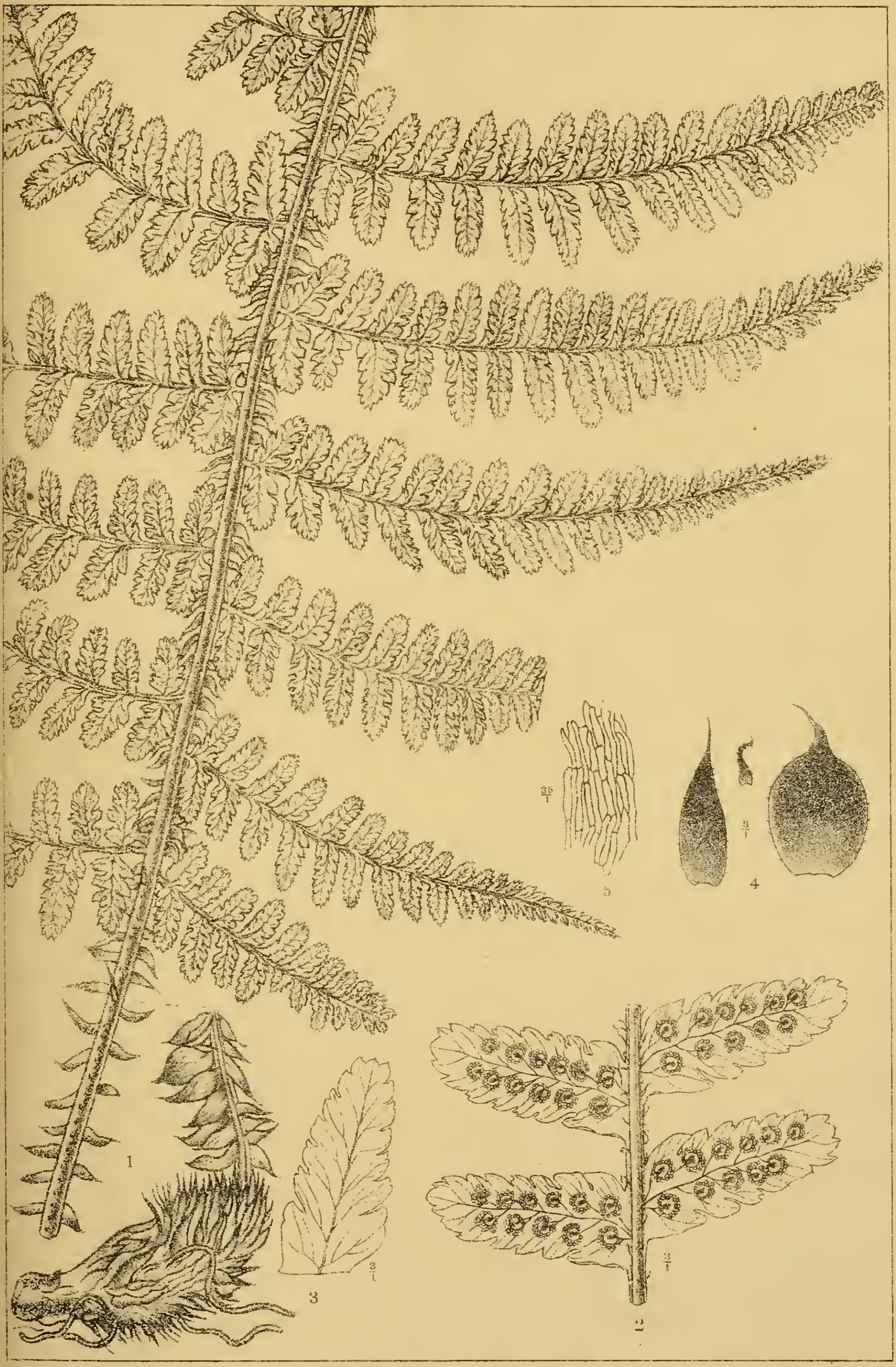
I give the "distribution" to Sikkim with hesitation, as the stipes of Sir Joseph Hooker's specimens are incomplete, and there are more veins in a segment than the N.-W. Indian specimens have. Of these (?) Mr. Clarke says—"Sir J. D. Hooker collected at Lachen in Sikkim, alt. 9-10,000′, a fern which seems a luxuriant form of *panda.*"

18. **Nephrodium Blanfordii**, n. sp.—*Plants* isolated; *caud.* suberect; *st.* in a tuft, generally short, wiry, densely clothed at base with long narrow bright chestnut scales, and higher up with broadly, ovate, acuminate, and lanceolate-acuminate, particoloured scales, both sorts truncate at base; *fr.* 1—2 ft. l., 6″—12″ br., lanceolate, truncate though somewhat narrowed at the base, bipinnate; main rhachis clothed with lanceolate-acuminate, particoloured scales, mixed with fibrillæ: secondary rhachises fibrillose; *pinn.* about 25 pairs, distant, but not more so towards base of frond, patent, linear-acuminate, broadest at base, cut down to a narrowly winged rhachis into 12—14 pairs of sessile broad-based pinnules set widely apart, having a confluent acuminate toothed apex; *pinnl.* oblong, bluntly rounded, divided more or less deeply into 4—6 slightly-toothed lobes; *texture* herbaceous; *ven.* costa of pinnule undulating and branching into the lobes; veins branching into 3—4 veinlets in the lobes; *sori*—one on each lowest superior veinlet of a group, near the costa, confined to upper part of the frond. (Plate XI.) *Nephrodium* (*Lastrea*) *remotum*, Blanf. in Journ. Asiat. Soc. Bengal, Vol. LVII, Part II, No. 4, 1888.

KASHMIR: Nagmarg and Sonamarg, 85-9000′, Trotter 1888. PUNJAB: *Hazara Dist.*—Kagan Valley 94-10,200′, Duthie's collector 1896-97; Dunga Gali 7-7500′, Trotter 1889; Chamba 6000′, J. Marten 1897; *Simla Reg.*—Ridge east of Simla, Kamalhori Mt. 9500′, Blanford 1885; "Common about Nágkanda at elevations between 8300′ and 9500′; Nágkanda to Bági 82-8500′, Hope 1886; Bisáhir—Sdeeling 9000′ Lace. N.-W. P.: *T. Garh.*—Ganges Valley above Jhàla 11-12,000′, Duthie 1891.

I give the fern entered in Blanford's List as *Nephrodium remotum* as a synonym of *N. Blanfordii*, because, having received from him specimens named *remotum*, which are exactly the same as those I collected in the same locality, at about the same time, I know that in his paper of 1888 he wrote of the same fern as I now do. But the plant is in no way near *N. remotum*, Hook. (not of Clarke, as Mr. Blanford quotes it), and must therefore be re-named. Mr. Blanford, who, when he wrote, had not, I believe, much studied European ferns, said—"I adopt Mr. Clarke's name for this fern, without implying acquiescence in the view that it is identical with the European prototype." He had previously, under his No. 66, *N. Filix-mas*, var. *marginata*, Wall., said that

PLATE XI.



N. E. Brown. delt.

Lith: by K. D. Chandra.

NEPHRODIUM BLANDFORDII, n. sp.

1. Portion of a rhizome & part of a frond.
2. Part of a pinna, undersurface, enlarged 3 diam.
3. Pinnule without sori, enlarged 3 diam.
4. Scales from the stipes, enlarged 3 diam.
5. Cells of the central part of a scale enlarged 35 diam.

there was an interval of 2,500 feet between the upper limit of that species and the lower limit of what he called *N. remotum*, and discussed the differences between those two ferns, arriving at the conclusion that altogether they indicated specific distinction. I cannot see even the remotest resemblances between them. *N. Blanfordii*, though there may be thought to be some similarity in the details of cutting, does not, as a whole, suggest the European plant, the pinnæ of which, as its name denotes, increase in distance downwards until they are three inches apart at the base ; whereas in the Himalayan plant the lowest pinnæ are not more "remote," and it is smaller than the British plant which, like the Continental European one, is believed to be a hybrid between *N. F.-mas.* and *N. spinulosum*, Desv. Mr. Barnes, of Beethwaite Green, Westmoreland, who long ago gave me a frond of *N. remotum* from an original plant received from Mr. Clowes, of Windermere, the discoverer of the so-called species, told me he believed it to be the above indicated hybrid, and that he had found that its spores produced typical *F.-mas.* I demur entirely to Mr. Clarke's statement that the typical plant figured by Hooker, Brit. Ferns, t. 22, is frequent in the West Himalaya, as I cannot find that it at all exists there. When gathering the two plants in the Simla Region I did not at first separate, except by size, *N. Blanfordii* from *N. ramosum*, Hope (in *Journ. Bot.*, March 1896) ; but I afterwards saw that they differed in shape and cutting of the fronds. *N. Blanfordii* is near *N. F.-mas* ; but it has no affinity to *N. spinulosum*, Desv., which has not been got in the Indian Region. In the *Journal of Botany*, under *N. ramosum* I said—" Perhaps the nearest congener of this species is *N. nemor lis* (a slip or misprint for *N. nemorale*), n. sp., Hope MS., a fern with a more limited range, hitherto called *N. spinulosum* Desv., var. *remota ;* but that species is never truly bipinnate, and it has always a short stipe and dark-coloured scales." When I thus wrote (in India), I was imperfectly informed as to the accepted meaning of the term "bipinnate." Also I have, in publishing, altered the specific name of this fern, because "*nemorale*" was thought to be too near that of a previously described species ; and I can find none more appropriate to it than one that will commemorate the name of the late Mr. H. F. Blanford.

Subgenus—EUNEPHRODIUM.

29. Nephrodium Papilio, n. sp.—*Plants* isolated ; *caud.* erect : in old plants subarborescent ; *st.* numerous, stout, rising regularly from round the apex of the caudex, very short, almost glabrous ; *fr.* lanceolate, generally suddenly contracted to a long deeply pinnatifid apex or terminal pinna and always prolonged downwards, with shorter and shorter auricled pinnæ, nearly to the caudex ; 1½—5ft. l., 4½—14in. br., the auricled short pinnæ occupying the lower 4—20in. ; *pinn.* 15—40 and more pairs (including those auricled) according to size of frond, narrow, rarely more than ¾in. broad, not much diminished in lower half, above gradually narrowing and ending in a very acuminate apex ; cut down ⅓ to nearly ½ way towards the rhachis, increasingly distant and becoming more opposite towards the base of the lanceolate portion of the frond where they suddenly shorten, become almost exactly opposite and deflexed, and throw out auricles upwards, which lengthen as the pinnæ shorten and become pinnatifid lower down, with separate costæ ; *segm.* of pinnæ curving upwards, broadly falcate, subentire, connected at the sinus by a hyaline web which extends towards the rhachis of the pinna over one or even two inter-venal spaces ; *texture* papyraceous ; *surfaces* practically glabrous : *rhachises* sometimes slightly villose or pubescent above, and occasionally with a few white hairs or setæ on the veins above ; *ven.* simply pinnate—veins 7—8 pairs to a segment, 1½—3 pairs uniting with those of continuous segments : an excurrent veinlet from the lowest pair free or sometimes joining only one of the next upper pair, and occasionally also another one or two before it reaches the sinus ; veins of the auricles branching in the shallow lobes, and uniting with those of the contiguous lobes when the auricles are more deeply pinnatifid ; *sori* small, medial on the veins, absent from the apices; *invol.* fugacious or shrivelling on top of the ripe sorus. (Plate XII).—

N. mólle, Desv., *var. major*, Bedd. Suppt. H. B. 76, in part.

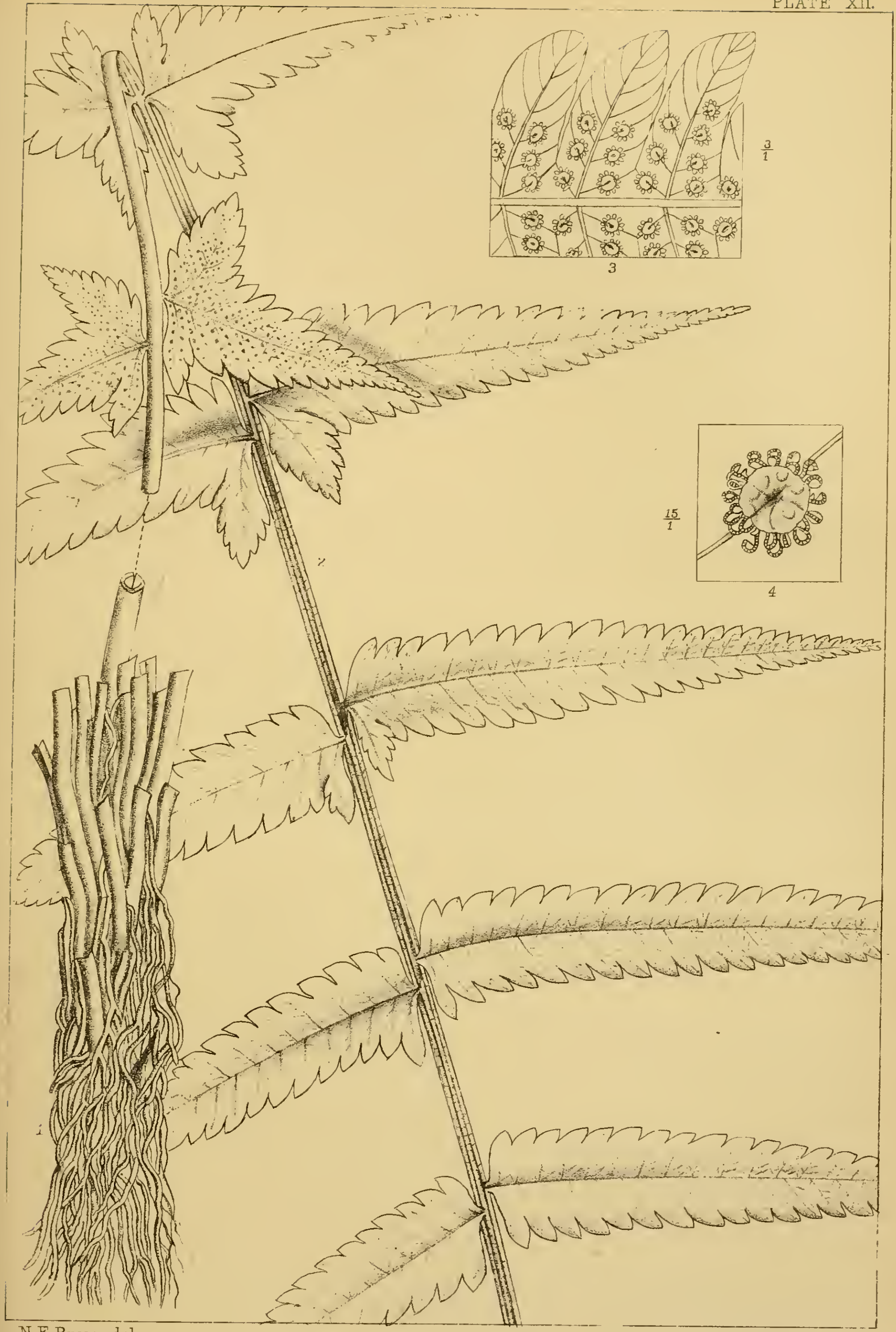
PUNJAB : *Chamba*, McDonell (in list of Chamba Ferns identified at Kew, named *N. amboinense*) *Simla Reg.*—Simla, 5th Waterfall, Collett 1883, Samála Nála 4500 Blanf. 1884 (under *N penniyerum*, Hook. var. *multilineata*, Wall.: it "occurs, together with *N. molle*, at the lowest levels visited below Simla (4500′), and I have it also from Mussooree, collected by Mr. C. W. Hope, and from below Chakrata ;" Simla—between 2nd Waterfall and Boileauganj, Bliss 1890.

N.-W. P. : *D. D. Dist* —In the Dun, near Malsi, and in the Song Valley near its exit from the Himalaya 26-2800′, Hope 1887-89 ; Mussooree—Duthie 1887, below Khiarkuli 4700,′ Hope 1880, Colonel Hersehell 1878 or 1879, Mossy Falls. 5500, Hope (with Duthie) 1882, below Arnigadh 5000′, Duthie 1882; *T. Garh.*—Surkunda Mt. 9300 Lev. 1872 ; north of Mussooree 3000′, Mackinnons 1879 ; near Bhatauli 4500′, Hope 1886 ; Thadiar 3500′, Gamble 1894. *Kumaun*—S. and W. No. 2 ; Gola Valley : seen in 1890 in cultivation at "Douglas Dale" 4500,′ brought from neighbourhood.

DISTRIB.—*Asia* : N. Ind. (Him.)—Nepal, *Wallich*, 1829. Sikkim—Poobsering below Darjeeling 4000′, *Lev.* 1880. Ceylon, *Thwaites* C. P 2498 (named *N. Hookeri*) and Ambáwala (or Ambawella), G. Wall. "Indian Archipelago," *Seemann*—" *R. Brown*, iter Austral. 1800-5."

I long ago named this species *N. papyraceum*, but that name has since been given by Colonel Beddome, in his Supplement of 1892, to a

PLATE XII.



N. E. Brown del.

A. C. Mukerjei lith.

NEPHRODIUM PAPILIO, n. sp.

1. Part of a rhizome, natural size.
2. Part of a frond, natural size.
3. Part of a pinna, under surface, × 3.
4. Fragment of a pinna, showing a sorus with the indusium, × 15.

species of his own making, some of which, I have good reason to believe, is only *N. aridum*, Baker (q. v.). The only resemblance it has to *N. molle*, Desv., of which Beddome says it is a variety, is in cutting and venation; in every other character it is different. It is a very handsome plant, with fronds rising in a ring round the apex of the subarborescent caudex, forming an inverted hollow cone like that produced in *Struthiopteris germanica*. *N. molle* does not grow so regularly. Other distinguishing characters are—the thin papyraceous texture; the almost glabrous surfaces; the prolongation of the frond down the shaft below the lance-head, so to speak; in short, broadened and auricled pinnæ, in almost exactly opposite pairs, which irresistibly suggest butterflies head downwards—the main rhachis representing the body; and, finally the fugacious or inconspicuous involucres. I have seen this fern in cultivation in the irrigated garden at "Douglas Dale," below Naini Tal, and consider it a strikingly beautiful plant. It seems to require wet, or occasionally flooded, ground for its full development, and consequently the caudex and stipes are naked, or nearly so. Mr. Levinge noted, regarding the specimens he collected below Darjeeling, and which he incorrectly named *N. truncatum*, Presl., that the plant grows 6—8 ft. high. Mr. Duthie and I got it more than 5 ft. high in a swampy patch in forest near Mussooree in 1882; but I could never find the spot again. *N. molle* is one of the commonest ferns in the Dehra Dun, and the outer N.-W. Himalaya at low levels, and it, too, likes water; but it is never glabrous, and never has the butterfly-auricled pinnæ extending down the shaft of the lance.

Colonel Beddome, in his Supplement of 1892, says—"Mr. Hope considers this a well-marked fern, and says that it is subarborescent, and of a brilliant green colour" (I don't recollect giving it the latter-mentioned character); "his specimens have quite an erect caudex; Mr. Wall's Ceylon specimens however, have a decidedly creeping root". . . . . "it is a most marked fern when fully auricled nearly down to the base of the stipe, but I find this is not always constant, as I have specimens which run *molle* rather close." I have since seen the Ceylon specimens Colonel Beddome referred to—two fronds with creeping rhizomes: the fronds are similar, though they have only 5 pairs of auricled pinnæ; but the creeping rhizome I consider quite enough to separate them, not only from *N. Papilio*, but also from *N. molle*. Thwaites's and Wall's specimens in Kew, cited above, have not a scrap of rhizome: otherwise they are *N. Papilio*.

30. **Nephrodium occultum**, n. sp.—*Caud.* (or *Rhiz.*) not seen; *st.* 14½—36 in. (incomplete) in length, slightly palaceous at base, as shown by scars of fallen scales; *fr.*—of small specimen 19½ in. l., 10 in. br.; of larger

specimens—34½—36 in. l., 15 in. br., truncate at base—lowest pinnæ being almost as long as any, pinnatifid ; *pinn.* 13—21 pairs with a large pinnatifid and slightly toothed terminal pinna, sessile, up to 9¼ in. l., ¾—1¼ in. (nearly) br., linear, acuminate, curving upwards, lowest 2—3 pairs which are patent or deflexed, cut down half-way into numerous (35—45) narrow curved falcate entire, or slightly crenate, segments of irregular length with a terminal tooth—the superior basal segment generally much longer, and the inferior much shorter, than those above ; *texture* papyraceous but not membranous, whole plant perfectly glabrous, except for a slight pubescence on upper side of sec. rh.; *colour* of lamina brown-green ; of stipes and prim. rh. pale brown tinged with pink, of sec. rh., perhaps pinker ; *ven.* obscure on upper side ; on under side distinct, costæ of segments coloured like sec. rh., veins very slender, 8—13 pairs, according to size of frond ; sometimes 15 pairs in superior basal segment and only 5 pairs in corresponding inferior segments, lowest pair uniting at an obtuse angle with the lowest veins of the contiguous segments, whence an excurrent venule arises, sometimes free, or, if ascending to the sinus, joined by 1—2 more pairs of veins curving upwards from the adjacent segments ; *sori* not seen. (Plate XIII).

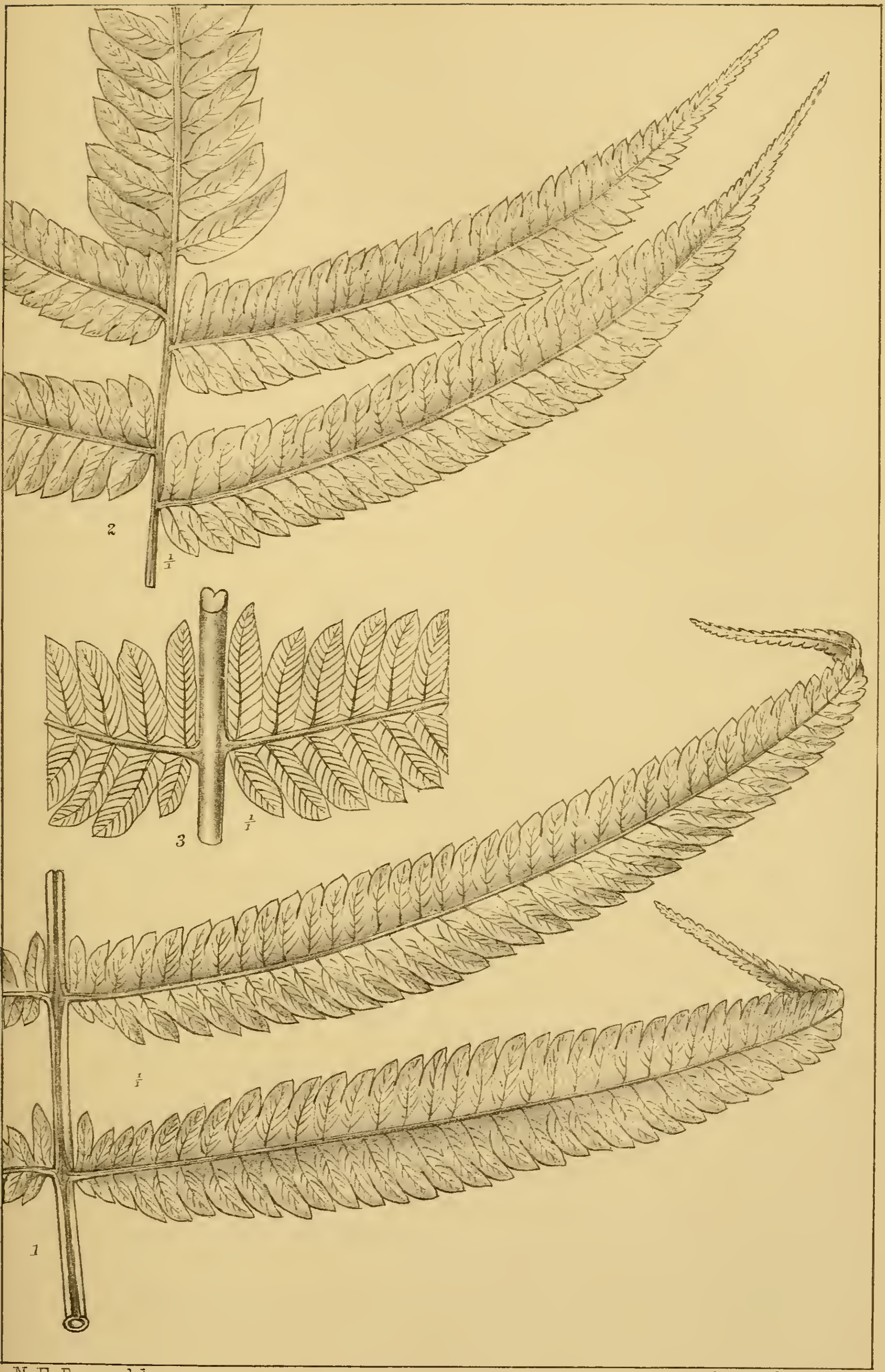
N.-W. P. : Tehri Garhwal (?) Found by me, in 1890, in the Mackinnons' collection, without tickets : 2 large and 2 small fronds.

The Mackinnons could give no account of this fern, and it may have been gathered by their collector when apart from them—probably fifteen years before I saw the specimens. None of the fronds were fertile ; there was no caudex or rhizome, and the stipes of the larger fronds were not complete ; but I have no doubt the genus is *Nephrodium.* This must be a striking looking fern, standing at least 6 ft. high, with a stipes as long as the frond.

Genus 26—POLYPODIUM, *L.*

Subgems—Phegopteris, Fée.

5. **Polypodium late-repens**, n. sp.—Trotter MS.—"*Rhiz.* widely creeping and branching, dark purple, furnished with numerous fibrous rootlets and acute light brown scales. *St.* 1—2 ft. long, scattered, dark purple and curved at the base, becoming light brown or straw-coloured above ; stipe and rhachis more or less scaly, glossy, furrowed when dry. *Fr.* lanceolate, 20—30 in. l., 8—12 in. br. at widest part, subbipinnate. *Pinn.* 20—30 pairs, distant below, but approximate towards apex of frond, lowest pair often reduced, sessile, 4—6 in. l., 1—1½ in. br. at base, tapering to a point, patent to erect, cut down nearly or quite to the midrib into decurrent, oblong, blunt pinnules



N. E. Brown. del. Chitra Silpi Cº lith.

NEPHRODIUM OCCULTUM, n. sp.

1. Portion of the base of a small sized frond, natural size.
2. Portion of the apex of ditto, showing the abrupt termination in a large pinna, natural size.
3. Basal parts of two pinnæ from the middle of a large frond, natural size.

¼ in. wide, margin acutely or crenately lobed ; *texture* herbaceous ; under surface hairy ; *ven.* pinnate in segments, free. *Sori* naked, medial, orbicular, terminal on veinlets, usually one, sometimes two or three to each lobe." (Plate XIV.)

Remarks by Mr. Trotter.

"This fern is not uncommon in the Western Himalaya, at an elevation of 7-9,000′. I have specimens from Kumaun and Garhwal, and have personally collected it at intervals from Simla to Hazara, where it is abundant, forming extensive patches. It seems to connect *Polypodium distans*, Don, with *Gymnogramme aurita*, Hook., combining the frond and sori of the former with the rootstock and stipes of the latter ; and when collected without rhizome it has frequently been mistaken for *P. distans*, from which in that mutilated condition it is not easily distinguishable.

"Its wide-reaching rootstock and scattered stipes, bent round at the base, are such well-marked characters as to entitle it, I think, to rank as a good species."

Kashmir : Chittapani Valley and Rattan Pir, 75-8000′, Trotter, 1888 ; Dardpura 4-6000′, MacLeod 1891.

Punjab : *Hazara Dist.*—Thandiana and Dungagali 75-8500′, Trotter 1890-92 ; Kagan and Siran Valleys 9000′, Duthie's collector 1896. *Chamba*—5-8000′, J. Marten 1897. *Kangra Valley Dist.*—Dharmsala 8000′, Trotter 1887 ; *Simla Reg.*—below Simla 5500′, and Jakó Mt. 7700′, Blanf., 1886 ; ridge east of Simla, Maihisu (Mahasu), 7500′ and spur north-west of Nágkanda, 8200′, Hope 1886 ; Hattu Mt. 9-10,000′, Gamble 1878, Collett 1885 ; Bàgi 9400′, Bliss 1891.

N.-W. P. : *D. D. Dist.*—Jaunsar, (or T. Garh. : ticket incomplete), Gamble ; Seal's Hill—East of Landour, 7000′, Hope 1887 and 1895 ; *T. Garh*,—Nag Tiba Mt. 7500′, Mackinnons 1879 ; near Bhatauli 4500′, Hope 1886 ; Phedi—East of Landour—5-6000′, Duthie 1881. *Kumaun* 7000′, S. and W. ; Durasu 6000′, Davidson 1875 ; forest above Shankala 9-10,000′, Duthie No. 3712 ; Sarju Valley 3-4000′, and Dhankuri 9,000′, Trotter 1891.

Distrib.—*Asia* : N. Ind. (Him.).—Nepal ; Sikkim (?).

The only previously described plant which may possibly be this is *Polypodium paludosum*, Bl. Fil., Jav., p. 192, t. 90 ; but Blume's plate shows only the upper part of a frond—14 pinnæ, a short tip, and an enlarged pinnule. Blume says—"Frond, 4-5ft. ; caudex," so far as he recollects, "repens, stipites efferens plures remotos."

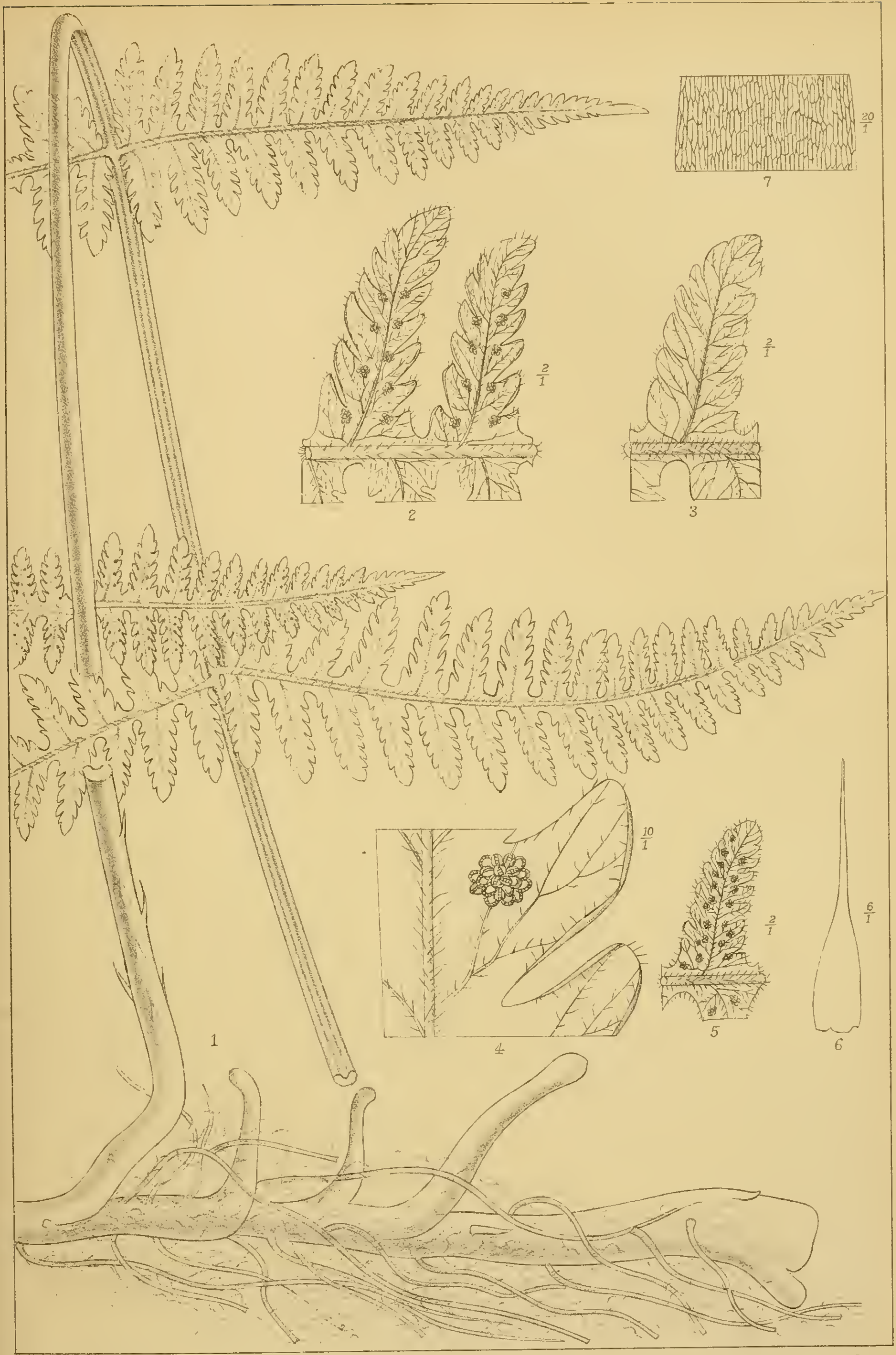
Beddome, in his "Ferns of S. India," p. 55, t. 168, said of *P. paludosum*—"Caudex short, erect, covered with scales at apex." He did not give *P. distans* as a synonym ; but in his Handbook, p. 292, he dropped *P. paludosum* as a species, and gave it as a synonym of *P. distans*, Don—referring to his F. S. I. t. 168. For *P. distans* he wrote a new and elaborate description (Don's being, as usual, short and incomplete), and said of it—"Stipe tufted." Don did not mention the nature of the caudex or rhizome. As synonyms, Beddome gave in the H. B. the three names he had given for *P. paludosum*, namely, *P. brunneum*, Wall. Cat. 333, *P. longipes*, Wall. Cat. 316, and *P. adnatum*, Wall. Cat. 328; and he added a fourth, *P. Griffithii*, Hook. Sp. Fil. IV, 236. Mr. Clarke gives *paludosum* and *longipes* as synonyms of *P. distans*, and resuscitates *P. adnatum* as a variety of it, and he gives *P. brunneum* as a synonym of *var. adnata* (sp.), Wall., besides creating two other new varieties. Of *P. distans* he said—"Stipes tufted."

Hooker, in *Sp. Fil.* IV, p. 244, did not give *P. distans* either as a species or as a synonym of *P. paludosum*, and as to the caudex of the last named plant merely said—"caudex?". The *Synopsis Filicum* says nothing as to the caudex of *P. distans*, for which it gives *P. paludosum*, Bl., as a synonym along with *P. Griffithii*, Hook., of which it is said that it appears to be a form with subentire lobes. Clarke said of *P. distans*—"Very difficult to distinguish from *Gymnogramme aurita*, Hook." (which has an extensively creeping rhizome) . . . "the rhizome is rarely present in herbaria;" and he noted that Beddome, in his Suppt. F. B. I. of 1876, p. 24, doubts if *G. aurita* is more than a form of *P. distans*. And Clarke went on to say—"the rhizome is very different," which I think may be taken to imply that he knew that *P. distans* had an erect caudex or rhizome. By the time he published his Handbook, Beddome seems to have become satisfied of the generic distinctness of the two plants.

So much for the books I am reviewing. I will now deal with the specimens in the principal public herbariums in the United Kingdom. In the Kew Herbarium, a specimen, named *P. distans*, collected by Jacquemont, which otherwise is *P. late-repens*, has no rhizome, but the base of the stipes is curved upwards, as if it sprung from a horizontal rhizome. Other specimens in Kew with erect caudices will be found referred to above under *P. distans*. Some of them collected by Mr. Clarke show well the erect caudex and tufted stipes of *P. distans*, and his *var. minor*.

In Wallich's collection, in the Linnean Society's Herbarium, there are specimens of the three species, which have been treated by our authors as synonyms for *P. distans*. Of *P. brunneum* Wall. Cat. 333, specimens from Kumaun, R. B. 1827, and Wallich, Napalia 1821, though they are without caudices, I should from their cutting put under *P. distans*. The next sheet, I should say, is certainly large *P. late-repens*; the stipe is nearly complete, but there is no rhizome: it is ticketed "*Polypodium* doubtful," but has been numbered in pencil 333. *Polypodium longipes*, Wall. Cat. 316, Napalia 1821, though there is no rhizome, is certainly *P. late-repens*. "*P. adnatum*, Wall. in Herb. 1823, Napalia 1821," is very large *late-repens*.

PLATE XIV.



N. E. Brown del.

A. C. Mukerjei lith.

POLYPODIUM (PHEGOPTERIS) LATEREPENS, Trotter.

1. Rhizome and part of frond, natural size
2. Two pinnules, under surface, × 2
3. A pinnule, upper surface, × 2.
4. One lobe of a pinnule, × 10.
5. Pinnule of a more finely divided frond, × 2
6. Scale from stipes, × 6.
7. Fragment of a scale from stipes, × 20.

The specimens in the British Museum, South Kensington, confirm the above generally, and a specimen on a sheet marked *P. distans*, E. Ind. Coll. H. and T., Sikkim, No. 17*a*, has a bit of creeping rhizome attached to the frond, which of course I call *P. late-repens*. Another sheet, with ticket—" 61 *Polypodium paludosum*, Bl., collected by Mr. Richard Oldham, 1564, Yamsay Formosa, recd. Apl. 66"—shows moderate sized fronds, 9—10 stipes in a fascicle, with the base of one thicker stipe ; but the cutting is of *P. late-repens.* The specimens on other sheets, named "*P. longipes*, Wall. 316, Napalia 1824," "*P. brunneum*, Wall., Kumaun R. Blinkworth," and "*P. adnatum*, Wall., Napalia" (his own ticket), are, in my belief, *P. late-repens.* Pinned to a sheet of "*Phegopteris brunea*, J. Smith (Wall.): synoym—*Polypodium paludosum*, Bl., Hook. Sp. Fil. 4, p. 244 ; Ind. Coll. H. and T., Nilgheri Mts., in. 15," is a note by J. Smith as follows :—

> Obs.—With regard to *Polypodium brunneum*, Wall. : *P. adnatum*, Wall., *P. longipes*, Wall., I never could satisfy myself as to whether they were distinct species, or only states of one species. I have seen no specimen showing their mode of vernation. I am inclined to consider that there are at least two species. In the *Sp. Fil.* Sir W. J. Hooker has placed them as synonyms of *Polypodium paludosum* of Blume. It is, however, probable that Blume's plant will be found distinct ; but this must depend upon future observers in collecting the specimens, and to particularly note their mode of growth (*sic*). Sir W. J. Hooker has described a new species which he calls *Nephrodium* (*Lastrea*) *microstegium* ; consequently an indusiate species, of which he has seen only one specimen of H. and T.'s from India. This appears to be the same as the two sheets here *marked** ; and what is singular, no indusium is shown on the plate. And as Wallich and myself have seen no indusium, I am inclined to believe it is a mistake ; but at the same time it is quite possible that in a young state seen alive indusiæ may be detected.
>
> "If all are one, the synonymy will be thus—that is, supposing that Blume's name has the priority.

Phegopteris paludosum, J. Smith.
Polypodium paludosum, Blume, Fil. Jav., t. 90.
Polypodium § Pheg. paludosum, Hk. Sp. Fil. 4, p. 244.
Aspidium paludosum, Bl. En. Fil. Jav., p. 168, according to Mett.
Polypodium longipes, Wall. Cat. 314 (316 ?).
Polypodium adnatum, Wall. Cat. 328.
Polypodium brunneum, Wall. Cat. 333.

? Nephrodium microstegium, Hk. Sp. Fil. IV., 119, t. 250. Ceylon, Gardner, No. 1151, V. S. Throughout India, Wall., Hook. and Thoms.

" What can Griffithii be ? " (This query is added in pencil.)

Finally, in the Levinge collection, in the Museum of Science and Art, Dublin, I have found a specimen, named *P. distans*, Don, from Garhwal, Levinge 1872, but on the ticket of which Mr. Levinge has written—" rootstock creeping widely." The frond of this specimen measures 4 ft. by 15½ in., but no stipes has been preserved. On the other hand, see Mr. Levinge's specimen with " tufted rootstock," cited by me under *P. distans.*

Mr. Trotter and I, after corresponding in India on the subject of this fern (see his remarks above), in the end agreed that it was a *Polypodium*, and, from its peculiar rhizome, entitled to specific rank. I asked Mr. Trotter to describe it, and in June 1891 he sent me the description given at the outset of this article. He said the description had been prepared, after repeated examination, to cover every single specimen in his collection. I have given it almost *verbatim.*

P. late-repens, like *Nephrodium repens*, Hope, is a lover of water, and I collected it first from swampy ground near Simla, where it was flourishing on a muddy, shaly talus. The rhizome and stipes were very succulent and brittle, and, with the scales, beautifully coloured—rather, perhaps, mauve than dark purple, as Mr. Trotter has it. The size and cutting of the fronds depend, of course, on the degree and luxuriance of growth of the plant. The sori are often oval. Hooker's remark that the frond of *P. paludosum* is invariably bipinnate does not apply to *P. late-repens*, the segments (or pinnules) of which are almost invariably united at the base, or decurrent on a winged rhachis (only in one of my numerous specimens does the wing appear to be interrupted); but at first sight some other specimens seem bipinnate. Blanford seems to have known the two plants, but yet to have placed them both as *P. distans.* He said :—

> " Common in ravines, down to my lowest level (4500′), and up to nearly 10,000′. At the former limit the fronds are small and narrow, with short, distant pinnæ, and the rootstock decumbent, hardly creeping. Above 7500′ the fronds grow to 3 and 4 feet in length, broadly lanceolate, and with close-set pinnæ 2 inches broad ; the pinnæ cut down square to a winged rhachis, segments deeply pinnatifid. Some specimens of these latter have a creeping rhizome."

Something might be inferred as to the nature of the plant named by Don, *P. distans,* if we knew with certainty what the specific name meant—whether it applied to the distance between the pinnae or to the distance between the fronds ; but, as Don does not mention the venation, and says—"*pinnis distantibus*," I think it may be concluded that the name refers to the pinnæ. Whether the present fern ought to be called *P. paludosum*, or by one of Wallich's three or four names, is a point that perhaps may never be settled ; but that it is distinct from *P. distans*, Don, cannot, I think, be questioned. In the difficulty Wallich created by not attending to the nature of the rhizome, and by giving so many names to his specimens, it seems advisable to give a new name to those that cannot reasonably be put under *P. distans*.

(*To be continued.*)

NESTING IN KASHMIR.*

By Lieut. N. F. T. Wilson, R.I.M.

(*Read before the Bombay Natural History Society, on 18th Sept.* 1899).

Having but lately returned from a visit to the dominions of His Highness the Maharajah of Kashmir, I think it may perhaps be of interest to your readers if I give a short account of some of the birds whose nesting habits we were able to observe there. At the outset, I must plead guilty to having unwittingly committed a breach of the local game laws, as we, on three occasions, took clutches of the eggs of birds protected under those laws ; but, inasmuch as they are presumably framed to prevent the wholesale destruction of eggs, of which the natives were, till lately, guilty, we felt that only the letter and not the spirit of the law had been broken, and anyhow, it was too late to repair the mischief. But it would be as well to warn any collector who proposed to follow our example, that such laws exist, and that a permit from the State Council is necessary to enable any one to take the eggs of game birds between the 15th March and 15th September.

A few birds whose nesting habits have not previously been recorded will be found amongst our list, otherwise it contains nothing new, and is chiefly interesting from the way our notes corroborate the remarks of observers who have worked the country before. The period of observation extended from early in May to the 13th August, but nothing was done by us after 12th July, on which date we heard that stringent orders had been issued to the village headmen to prevent any eggs from being taken. The numbers and names are those used by Oates and Blanford in the Fauna of British India.

9. *Corvus monedula.*—The Jackdaw.—Very common, nesting in holes in high banks of the Jhelum and also in the walls of old forts at Sopur and Uri. Eggs during the early part of May.

99. *Trochalopterum lireatum.*—Himalayan Streaked Laughing-Thrush.—Common in the low bushes and jungle which cloth emany of the sides of the hills. Eggs during May, June and July.

187. *Myophoneus temmincki.*—The Himalayan Whistling Thrush.—Birds common, but nests hard to find. Nest and 2 fresh eggs were taken from underneath an enormous boulder in the bed of

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* Note.—This article was written before I saw Mr. Davidson's description of a similar expedition in the " Ibis."

the Rewal Nullah, Sind Valley, on 6th June. The bird flew out and was shot, otherwise the nest would certainly have escaped observation.

199. *Hodgsonius phœnicuroides.*—Hodgson's Short Wing.—The nest of this bird (not described by Oates) was found by my brother on 13th June at Sonamerg. I found another nest on the 18th, but unfortunately empty. The female was shot off the first nest and the male later. The nest was placed in some low brushwood, on the side of the hill lining the Sind Valley. It was situated about 1½ft. above the ground, and consisted of a massive cup-shaped structure, the cup measuring 2½″ across and 2″ in depth. It was built of coarse grass and leaves, lined with fine grass or vegetable fibre and a little hair and feathers. The eggs, 3 in number, slightly incubated, were of a deep greenish-blue colour, in texture firm, and with a slight gloss. They averaged ·84″ × ·64″.

We saw several pairs of these birds about Sonamerg. They were not very shy, but kept to undergrowth, dodging and skulking about in it, and seldom remaining still for more than a few seconds.

284. *Molpastes leucogenys.*—White Cheeked Bulbul.—Common. Eggs during May in the Sind Valley.

341. *Certhia himalayana.*—Himalayan Tree Creeper.—This bird was common at Sonamerg in June. We found several nests mostly with young, in that month, in holes in trees, and one nest with 3 incubated eggs on the 11th June. The normal number of eggs seems to be 3.

352. *Anorthura neglecta.*—The Kashmir Wren.—Found 3 nests of this bird in June at Sonamerg, one with young, one empty, and on the 20th one with 5 fresh eggs. This nest was built in the roots of a tree overhanging the Sind River. It was of the usual Wren type and consisted chiefly of moss lined with hair and feathers. The bird was sitting at the time and hovered around whilst we were there. The eggs were white, finely spotted with brick red.

363. *Acrocephalus stentoreus.*—The Indian Great Reed Warbler.—Numerous in the reeds which cover some of the lakes and jheels in Kashmir. Numbers of eggs were taken in June and July.

367. *Acrocephalus agricola.*—Paddy-field Reed Warbler.—This bird was found breeding by us on a large marsh near Sumbul on July 11th. The nest differs considerably from the description given on page 360 of Blanford, and the eggs do not appear to have been previously recorded.

Five nests were found altogether (one forwarded to the Society's collection), one containing 3 eggs, slightly incubated, one, 1 egg fresh, and another nest had a perfectly fresh egg lying broken beside it. The others were empty. All the nests were beautiful cups of moss, lined with grass and a few feathers, and were placed about 2 feet off the ground supported on two or three reed stems, with which the nests were interwoven. The measurements of the nest cups were about 1·8″ deep and 2″ across. This species were the only small birds on the marsh with the exception of the yellow head wagtail, *M. citreoloides.* We shot one with some difficulty, having only a shot gun and large cartridges. The specimen has been presented to the Society's collection. The eggs were exact miniatures of the large reed warbler, *A. sientoreus*. The ground-colour is pale green, and the eggs are spotted and blotched with black and purple spots. The texture is fine, and there is little gloss. The average of 3 eggs was ·62″ × ·50″.

402. *Sylvia affinis.*—Indian Lesser White Throat Warbler.—Common in the low scrub jungle clothing the hill sides. Numerous nests and eggs in the Sind Valley, May and June. One nest added to Society's collection.

418. *Phylloscopus humii.*—Hume's Willow Warbler.—Fairly common at Sonamerg, found several nests with eggs, one on 11th June contained an egg of presumably No. 1105, the Himalayan Cuckoo. The nest was built in a hole in the stump of an old tree close to the ground and contained 4 eggs, all white faintly speckled with red spots. The average measurement of 3 eggs was ·5×·32″. The fourth egg measured ·87″ × ·61″. Supposing this is to be the egg of a Cuckoo, it must have been carried to and placed in the nest in the bird's bill, the nest aperture being too small to admit of the entrance of so large a bird.

429. *Acanthopneuste trochiloides.*—Blyth's Crowned Willow Warbler.—The nesting of this species has not been previously described. We found two nests on 19th June at Sonamerg, and on each occasion shot the parent bird. Both nests were built in the hollow spaces of decayed fallen trees. They were dome-shaped structures, consisting chiefly of moss lined with hair and feathers. Both contained fresh eggs, 1 and 4 respectively. The eggs were pure white, and measured ·63″×·45″.

428. *A. occipitalis.*—Large Crowned Willow Warbler.—Fairly common at Sonamerg, where we took 4 nests on 14th, 15th and 17th June.

476. *Lanius erythronotus.*—Rufous Backed Shrike.—Very common all over the Valleys of Kashmir. Eggs in May and June.

518. *Oriolus kundoo.*—Indian Oriole.—Very common all over the Valleys. Eggs in May and June.

529. *Sturnus humii.*—The Himalayan Starling.—Common everywhere in the Valley. Eggs in May.

589. *Alseonax ruficaudus.*—The Rufous Tailed Flycatcher.—The nest of the bird does not appear to have been found before. We found one nest on the 18th June on a pine branch at Sonamerg, situated about 10 feet from the ground, it was very well concealed, and had the bird not flown off, it would certainly have escaped observation. It was a small cup-shaped nest of moss and lined with hair and feathers. It contained 2 slightly incubated eggs. The ground-colour was buff with a rufous clouding and a few brown spots on the larger end. They measured ·72″ × ·52″. We shot the bird and, though we made careful search, saw no others during our stay.

598. *Terpsiphone paradisi.*—Indian Paradise Flycatcher.—Not very common. Only found one nest on 9th July with 3 fresh eggs.

610. *Pratincola maura.*—Indian Bush Chat.—Birds common, but only found one nest with 4 eggs at end of May.

638. *Chimarrhornis leucocephalus.*—White-capped Redstart.—Very common about Sind River, at Sonamerg, but could find no nests.

646. *Rhyacornis fuliginosus.*—Plumbeous Redstart.—Common at Sonamerg, where we found several nests in June with fresh eggs.

654. *Ianthia rulata.*—Red-flanked Bush Robin.—Not very common, but we got two nests, each with 4 eggs, on the 12th June.

678. *Merula unicolor.*—Tickell's ouzel, or in the descriptive words of Jerdon, the dusky ground-thrush, was very common, and we took numbers of eggs in May and June.

691. *Petrophila cinclorhyncha.*—Blue-head Rock Thrush.—Common. Eggs numerous in June.

719. *Tharrhaleus jerdoni.*—Jerdon's Accentor.—Not very common, but found two nests at Sonamerg, each containing 3 eggs, on 12th and 15th June, respectively. The eggs averaged ·76″ × ·56″.

775. *Gymnorhis flavicollis.*—Yellow-throated Sparrow.—Common. Several nests with eggs in June and July.

779. *Passer montanus.*—Tree Sparrow.—Common; numerous nests and eggs in May and June.

780. *Passer cinnamomeus.*—Cinnamon Tree Sparrow.—Common. Three nests with 4 eggs in June.

790. *Emberiza fucata.*—Grey-headed Bunting.—My brother found one nest with 3 eggs on 30th May.

794. *Emberiza stracheyi.*—Eastern Meadow Bunting.—Very common in the Sind Valley, where we found number of nests in June, generally with 4 eggs.

813. *Hirundo rustica.*—Swallow.—Common, but we did not take any eggs.

830. *Motacilla hodgsoni.*—Hodgson's Pied Wagtail.—This was the commonest wagtail in the valley, and we found numbers of nests in May and June.

832. *M. melanope.*—Grey Wagtail.—Fairly common. Found three nests in the Sind Valley in May and June.

838. *M. citreoloides.*—Hodgson's Yellow-headed Wagtail.—As little is known of the nesting habits of this bird, it may be as well to describe the only absolutely authentic nest I found. It was situated on the same marsh as the nest of *A. agricola* described above, and contained but one egg. The nest was built of grass and vegetable fibre, well constructed and lined with fine hair, and was placed under a clump of some foxglove-like plant which formed little clumps all over the marsh. Numbers of empty nests were found of similar construction, but we were too late for the eggs. The birds were fairly numerous, and I regret we did not shoot some specimens. However, we had ample opportunities of examining them closely; the black upper plumage effectually distinguished them from *M. citreola*, the only birds for which they could be mistaken, and which, moreover are only winter visitors. My egg, which exactly tallies with Blanford's description as regards colour, measures ·8″ × ·62″, and my brother, who found a nest of this species at Sonamerg, gives the measurement of the two eggs he got as the same. From some native collectors we obtained several other eggs exactly similar to those described, and they pointed

out these birds to us when asked what species the eggs belonged to.

860. *Alauda arvensis.*—The Skylark.—Common. Found four nests in June, each containing 3 eggs.

1003. *Iynx torquilla.*—Common Wryneck.—The nest of this bird has been found before in Kashmir, and we were fortunate enough to find one nest in a hole in an old tree, about 10 ft. from the ground, at Sonamerg. It contained 8 fresh eggs, and the female was shot off the nest.

1024. *Coracias garrula.*—European Roller.—This bird was quite one of the commonest met with. We were, however, very unlucky in nearly always finding young birds in the nest holes. The only eggs procured were from a native collector.

1029. *Merops apiaster.*—European Bee-eater.—Like the previous species, this was the common bee-eater of Kashmir. We never found eggs, though on several occasions we dug out the old bird and found young in the nest-hole. They appear to be more solitary in their nesting habits than *M. veridis*, as on no occasion did we find more than one nest occupied, though the river bank was often riddled with nest-holes.

1035. *Alcedo ispida.*—Common King-fisher.—Very common. Eggs in May, June and July.

1066. *Upupa epops.*—European Hoopoo.—Common. Eggs in May and June.

1310. *Tutur risorius.*—Indian Ring-dove.—Very common in the valleys. Eggs in May and June.

1305. *Tutur ferrago.*—Indian Turtle-dove.—Common. Eggs in May and June.

1393. *Porzana pusilla.*—Eastern Baillon's Crake.—This is a bird seldom seen, but from the numbers of nests we found on the Sumbul marsh it must be far from uncommon. The nests were as described by Blanford, Vol. IV, page 166. The normal number of eggs is 7. In several nests we found eggs broken by crows or rats, most of the eggs having but a small round hole in them, as though made by a bird's beak.

1398. *Amaurornis fuscus.*—Ruddy Crake.—Another bird hard to find and whose nest eluded all our searching. The villagers used to bring in quantities of these eggs, and though we supposed them to belong to this species, we had a bird shot to make certain. Fortunately, a female was shot with a fully-formed egg in her, so all doubts were satisfactorily settled.

1402. *Gallinulla chloropus.*—Moor Hen.—The commonest of the water birds of Kashmir. Eggs in June and July.

1429. *Hydrophasianus chirugus.*—The Pheasant-Tailed Jacana.—Very common on the large Kashmir lakes where we got eggs in June and July.

1431. *Sarcogrammus indicus.*—Red Wattled Lapwing.—Fairly common. Eggs in May and June.

1447. *Ægialitis dubia.*—Little Ringed Plover.—This bird was common on the islands of the Jhelum River where we got eggs in May and June. As noticed by Blanford, page 243, we found two distinct types of these eggs.

1460. *Totanus hypoleucus.*—Common Sandpiper.—Fairly common. On the islands sand banks of the Sind River, we found several nests in May and June. They generally contained 4 eggs, the nests consisting of slightly built and shallow cups of grass and roots usually placed in the centre of grass clumps.

1454. *Gallinago cœlestis.*—Common Snipe.—We came across about 6 couple of these birds on the Sumbul marsh. We found several of the nests, but only two contained eggs. The nests placed in the centre of a clump of thick grass or bracken, were shallow cups of dried coarse grass without lining of any kind. We put the bird off the nest on two occasions. The first nest contained four beautifully fresh eggs and the second two. One of these eggs was fresh and the other broken and badly addled! Though the snipe never left the marsh during our search, we heard nothing of the drumming noise, but on several occasions noticed a bird hovering over its nest before settling.

1488. *Rostratula capensis.*—Painted Snipe.—Very common. Eggs in May and June.

1496. *Hydrochaledon hybrida.*—Whiskered Tern.—Very common. We raided a colony of these birds on 22nd June, taking a few eggs.

1570. *Ardetta minuta.*—Little Bittern.—Common on the Anchar and Woolar Lakes. We found several nests in June on the former, usually placed in long reeds, they were shallow saucer-shaped nests, of dried reeds and grass. Eggs white, rather long ovals, 5 or 6 in number.

1606. *Nyroca ferruginea.*—White-eyed Duck.—A few of these birds were breeding on the Anchar Lake in June, and on the 21st we were lucky enough to get one nest containing 10 eggs slightly incubated. A peculiar thing about this nest, off which the bird rose when I was about 20 yards off, was that all the eggs were carefully covered up with reed, as those of the Grebe are found ; the nest was in a clump of thick reeds, and I saw the bird over them as she rose and found the eggs covered up as described. I do not remember seeing this noted before, except in the well known case of the Little Grebe.

This completes the list of eggs found by us in Kashmir. Of course our trip was not wholely devoted to egg collecting, and except at Sonamerg and Sumbul, we spent very little time in searching for nests, most of our finds occurring on the line of march or when moving up or down the river by boat. But it shows that it is a country that will well repay the efforts of collectors ; and in the high camping grounds at Sonamerg and other places, really splendid eggs are to be found, and in many of these camps there is so little to employ one's time, that it is well to have some such hobby to follow. The want of a collecting gun was sorely felt by us, as our 12 bore usually destroyed the small birds we shot as specimens.

A NEW SEA-SNAKE OF THE GENUS *DISTIRA*, FROM KURRACHEE.

By G. A. Boulenger, F.R.S.

(*With a Plate.*)

(*Read before the Bombay Natural History Society on 28th June,* 1899.)

Distira Gillespiæ, sp. nov.

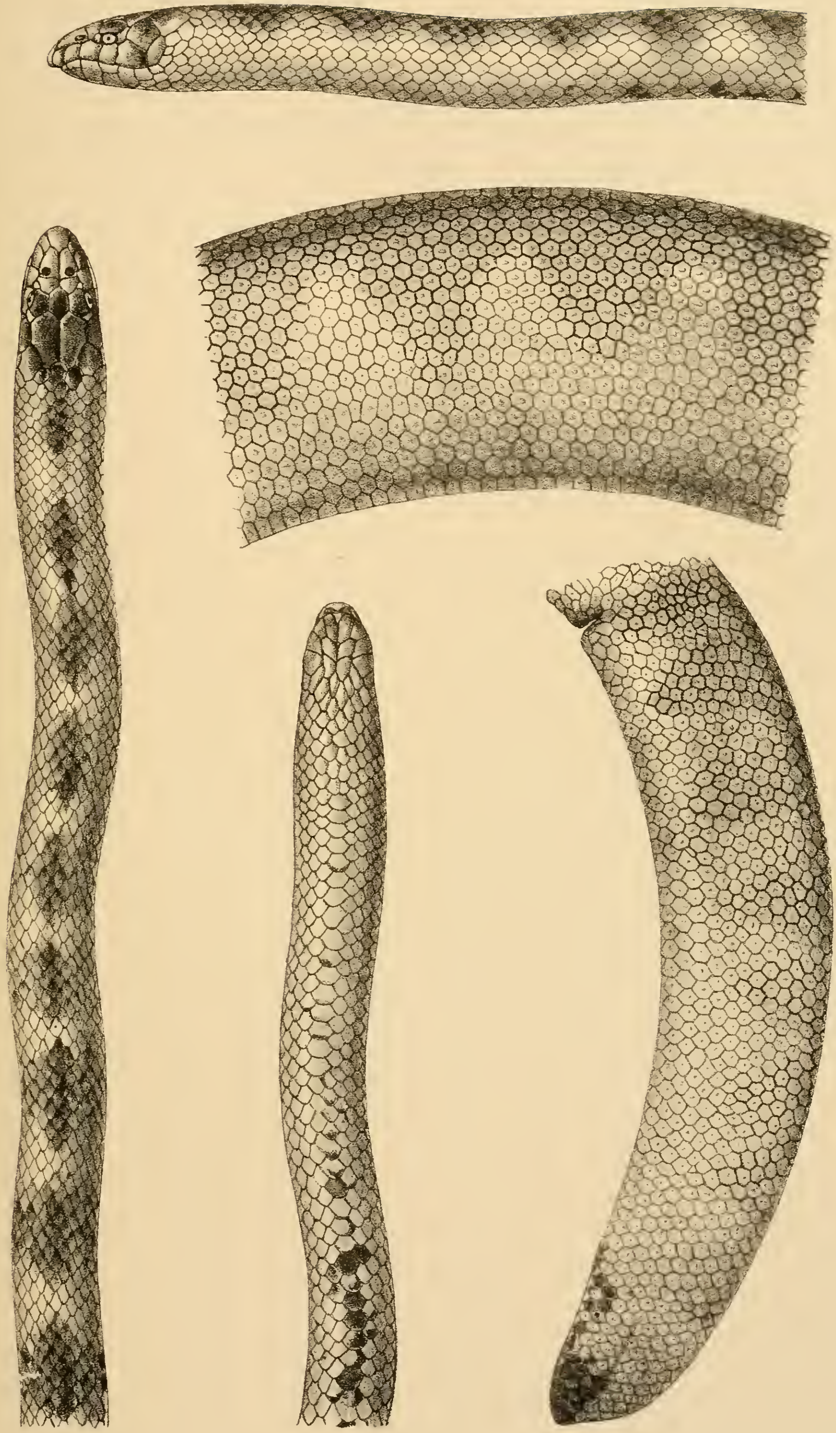
Head small ; body much elongated ; neck slender ; its diameter two-sevenths the greatest depth of the body. Rostral slightly deeper than broad ; nasals as long as the frontal, three times as long as the suture between the præfrontals ; frontal once and two-thirds as long as broad, as long as its distance from the rostral, scarcely more than half the length of the parietals ; one præ-and one postocular ; a single, large, anterior temporal ; six upper labials, fifth largest, third and fourth entering the eye ; two pairs of chin-shields, in contact with each other, 23 feebly imbricate, smooth scales round the neck, 44 hexagonal, juxtaposed, feebly keeled scales round the thickest part of the body. Ventra feebly enlarged but distinct, 372. Greyish-olive above, yellowish below, the darker colour forming very indistinct bars down the sides ; these bars accompanied by deep black spots on the anterior half of the body ; black spots confluent into an irregular stripe along the belly, confluent with the black bars of the sides, and disappearing on the hinder part of the body ; snout and upper lip yellowish, crown dark olive.

Total length 1,035 ; tail 120 millim.

A single female specimen formed part of a small collection brought together by Mr. F. W. Townsend with the assistance of Lieut. R. St. John Gillispie, R.E., and his wife, as a compliment to the latter I have ventured to name the species. The snake was caught on the surface of the water in Kurrachee harbour in August, 1898.

Distira gillespiæ is nearest allied to *D. subcincta*, Gray, from which it differs in the deeper rostral, the single postocular, the number of upper labials, and the juxtaposed scales on the body.

The same collection contained a large female of *Distira stokesii*, Gray, measuring 4 ft. 10 in., caught in August last floating on the surface in Kurrachee harbour, and entirely covered with a thick growth of green weeds referable to 2 or 3 species of *Ulva* and 2 or 3 species of *Enteromorpha*, both common genera of green Algæ, as I am informed by Mr. Vernon H. Blackman. The specimen, on being cut open by Mr. Townsend, was found to contain 12 well-developed young, measuring from 12 to 16 inches, in addition to two undeveloped ova forming part of the same chain and situated between the fertile ova.



J. Green del et lith
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DISTIRA GILLESPIÆ.

(New Sea-Snake from Kurrachee.)

A CATALOGUE OF THE *HETEROCERA* OF SIKHIM AND BHUTAN.

By G. C. Dudgeon, F.E.S.

With Notes by H. J. Elwes, F.Z.S., F.E.S., &c.,

and

Additions by Sir George F. Hampson, Bart., B.A., F.E.S., &c.

Part VI.

(*Continued from page* 303 *of this Volume.*)

Family PSYCHIDÆ.

Sub-Family ŒCETICINÆ.

Genus Clania, Wlk.

617. *C. crameri*, Westw.

Sikhim, 1,800 feet. I took several hundreds of pupæ and larvæ from China tea bushes on the Punkabaree Estate in November, and obtained 25 perfect males from them. As soon as the insects have fully developed their wings they batter themselves to pieces in a very short time. The larva forms a case of the small twigs taken from the tea bushes, and feeds on the hard leaves and bark. The latter seems to be eaten as much as the former. My specimens emerged in January, February and March.

618. *C. variegata*, Snell.

Sikhim and Bhutan, 1,000 to 3,000 feet. I took quantities of larvæ of this species at Badamtam in the sâl forests, on the leaves of which I found it feeding. I afterwards took it sparingly on tea, especially Assam and Manipuri plants. I gave its life history in a paper published in the *Indian Museum Notes*, in which it was named for me by Mr. Moore as *Eumeta sikhima*, Moore (sunk as a synonym by Hampson). The larvæ are not found in quantities together as are those of *C. crameri*, Westw. The specimens in my collection were taken or emerged in February, March and September. I have only once obtained it at light.

Genus Amatissa, Wlk.

619. *A. consorta*, Templ.

Bhutan, 2,500 feet. I reared one female taken as a pupa in August, and placed it on a tree-trunk not far from my house, visiting it every ten minutes. In half-an-hour I had taken two males from it, one, unfortunately, having been there too long; the result was that no more males approached the female. I have invariably found that, as soon as a male Psychid has had connection with a female, the latter ceases to attract other males, but so long as this can be prevented males can be taken one after the other with great facility.

Sub-Family PSYCHINÆ.

Genus Acanthopsyche, Heyl.

Sub-genus Œceticoides, Heyl.

621. *Œ. bipars*, Wlk.

Sikhim, 5,500 feet. This is a destructive insect to tea at higher elevations. I obtained a pupa at Tukvar from a bush which was completely stripped of leaves and bark. This emerged as a female in November and I was fortunate enough to obtain 7 males from it before connection was made, when, although I saw a few more males flying around, I was not able to induce them to settle. The abdomen of the male in the *Psychidæ* is capable of great elongation, and this is necessary, as it is required to be forced between the body of the female and the pupa shell, in which the female remains until she has completed her oviposition, in order to effect copulation. In the only specimen of a male now remaining in my collection, veins 1*c* and 1*b* do not appear to anastomose, but Sir George Hampson assures me that the specimen which I gave Mr. Moore, and which was taken from the same female, is normal.

Sub-genus Metisa, Wlk.

630*a*. *M. canifrons*, Hmpsn.

Sikhim. This is a small species, the pupa of which is formed in a case similar to that figured by Hampson of *Psyche* (*Heylærtsia*) *fusca*, Hampson. The type is in the British Museum.

630*b*. *M. gigantea*, n. sp. (Plate I, Fig. 14, ♂).

Sikhim, 1,800 feet. Differs from typical *Metisa* in the forewing having veins 4 and 5 stalked; 7, 8, 9 and 10 stalked: hindwing with 4 and 5 from a point, and a spur from the middle of 8 towards the costa.

♂. Antennæ strongly bipectinated to the tip; thorax pale brownish; abdomen covered with long hair. Forewing fuscous-brown, the area below vein 2 and the median nervure dusky ochreous. Hindwing with the outer margin slightly excised from vein 1*c* to vein 3, fuscous throughout. Three specimens taken at light at Punkabaree, two in August (*Dudgeon*). *Exp.* 52 millim. Type in British Museum.

There are several other species of this family found in Sikhim judging by the larva cases constantly being found, but they are extremely difficult to rear.

Family COSSIDÆ.

Genus COSSUS, Fabr.

651. *C. acronyctoides*, Moore.

Sikhim. I have only received two specimens, one of which was taken in May.

655. *C. pallidalæ*, Hmpsn.

Sikhim and Bhutan, 1,800 to 3,000 feet. A family common species in April and May, especially at Punkabaree at light. Perfect specimens are, however, difficult to obtain.

Genus DUOMITUS, Butl.

658. *D. ceramicus*, Wlk.

Sikhim. I took two males of this species at light at Punkabaree in July and August. It must be rare, as I have never seen others.

659. *D. strix*, Cram.

Sikhim and Bhutan, 1,500 to 2,500 feet. I took two specimens in May, both females. It seems rather rarer than the last.

660. *D. leuconotus*, Wlk.

Sikhim. I have not seen this from the locality.

661. *D. mineus*, Cram.

Sikhim. I have seen six specimens of this species only ; one a female in Dr. Pilcher's collection, another female taken, I believe, by Dr. Seale near Darjeeling, two males which I took at light at Punkabaree in September, and two females taken by me in August and September in the same locality.

662. *D. fuscipars*, Hmpsn.

Sikhim. (The type which was taken by one of Möller's native collectors is the only specimen I have ever seen.—*H. J. E.*)

662*a*. *D. pardalis*, n. sp. (PLATE I, FIG. 17, ♂).

Sikhim, 1,800 feet. Neuration as in *Duomitus stigmaticus*, Moore, veins 4 and 5 of the hindwing being given off separately.

♂. Antennæ brown ; head white ; thorax brownish-white, with a narrow dark dorsal stripe with a row of three rather large black spots on either side of it and another single spot just above the origin of the forewing ; abdomen brownish-white, each segment ringed with black, interrupted dorsally by a pale brownish band throughout. Forewing dull white with the veins brownish, reticulated with large black strigæ and forming a row of oval spots beyond the cell ; a large round black spot just beyond the disco-cellulars. Hindwing fuscous, paler at inner margin ; a sub-marginal row of white striations ; veins brownish.

Punkabaree at light (*Dudgeon*). *Exp.* 46 millim. Type in the British Museum collection.

656. *D. stigmaticus*, Moore.

Sikhim and Bhutan, 1,800 to 3,000 feet. This was originally described as a *Cossus*, and was subsequently placed by Hampson in *Azygophleps*. Hampson now agrees that, on account of the neuration, it should be placed in this genus. It is a common species attracted to light, flying in September and November.

Genus DUDGEONEA, Hmpsn., ined.

656*a*. *D. leucosticta*, Hmpsn., Joun. Bom. N. H. Soc., ined.

Sikhim, Punkabaree, 1,800 feet. 1 ♂. (A slight local race of this species occurs at Sierra Leone.—*G. F. H.*)

Genus AZYGOPHLEPS, Hmpsn.

663. *A. albofasciata*, Moore.

Sikhim. I have not procured this.

Genus ZEUZERA, Latr.

667. *Z. indica*, Herr.-Schäff.

Sikhim. I have not seen a specimen from this locality.

669. *Z. multistrigata*, Moore.

Sikhim and Bhutan. 4,000 to 7,000 feet. This is not uncommon in August, and may be taken at light in Darjeeling and Kurseong. (Common at light at Darjeeling in July and August.—*H. J. E.*)

670. *Z. coffeæ*, Neitn.

Sikhim, 1,800 feet. I took 4 males at light in the Balasun valley in May, June and September.

Genus PHRAGMATÆCIA, Newm.

671. *P. castaneæ*, Hübn.

Sikhim and Bhutan, 1,500 to 2,500 feet. This is an extremely variable species, both in size and markings. In 6 or 7 specimens taken in March in Bhutan the bodies were shorter and more robust and the wings broader. I have specimens taken in March, June, July, September and October.

Family ARBELIDÆ.

Genus Arbela, Moore.

675. *A. tetraonis*, Moore.

Sikhim. I took a single specimen, which is now in the British Museum collection. I have not seen another.

Genus Encaumaptera, Hmpsn.

677. *E. stigmata*, Hmpsn.

Sikhim, 1,800 feet. I have two specimens of this, which were taken by me in May and June in the Balasun valley at light.

Family HEPIALIDÆ.

Genus Palpifer, Hmpsn.

678. *P. sexnotatus*, Moore.

Sikhim, 1,800 feet. Five specimens taken at light in May and June, one only has the basal area of the hindwing fulvous-yellow, there is also a pale buff marginal mark on the outer margin of the hindwing below the apex. (I took this myself at light at Darjeeling on July 20th, and have specimens from the Naga hills taken at from 5,000 to 6,000 feet. It is a rare species, however, in both localities.—*H. J. E.*)

Genus Hepialiscus, Hmpsn.

680. *H. nepalensis*, Wlk.

Sikhim and Bhutan. I have only two specimens, both of which had pink hindwings when fresh, but this colour soon fades out. (I think I have two species under this name, but it is impossible to describe any of the Hepialids properly, unless the specimens are fresh. The insect is rare in June.—*H. J. E.*)

Genus Phassus, Wlk.

681. *P. aboë*, Moore.

Sikhim. I have only one specimen in my collection.

682. *P. punctimargo*, Hmpsn.

Sikhim. One male taken in June. (I have one male from Atkinson's collection which was there under the name of *P. aboë*, but which Sir. G. Hampson calls *P. punctimargo*. I confess that I think the Indian species of this family are, for want of good material, imperfectly worked out at present.—*H. J. E.*)

683. *P. damor*, Moore.

Sikhim, 1,800 feet. My only specimen, taken in September, has more silvery spots than are given in the description and figure in Butler's Ill. Het., Vol. VI. The thorax, legs, head and some of the markings of the forewing are sap-green. It may be *P. viridis*, Hmpsn., of which I have not seen the type specimen.

685. *P. signifer*, Wlk.

Sikhim, 1,800 feet; Bhutan, 2,500 feet. I have specimens taken in March and April only. The abdomen and hindwings are pink when fresh, which colour however fades quickly. I have never seen a specimen coloured like Butler's figure, though the markings of my specimens are identical. (What Sir G. Hampson has identified in my collection as *P. signifer*, Walker, from the Khasias, has the hindwing dark brown, almost black towards the base, and is almost certainly distinct from a Sikhim specimen, which is little more than half the size, and which has the hindwing uniform pale brown.—*H. J. E.*)

Family CALLIDULIDÆ.

Genus Cleosiris, Boisd.

690. *C. catamita*, Geyer.

Sikhim and Bhutan, 1,500 to 3,000 feet. This insect is common at Badamtam in shady roadways, and resembles the butterfly *Symbrenthia hippoclus* when settled with its wings closed. I have also taken it at light in May, although the family is essentially a day flying one. It occurs from May to August.

Genus Callidula, Hübn.

692. *C. erycinoides*, Wlk.

Sikhim and Bhutan. This occurs at higher elevations than the last. I have never seen it alive, but believe that my collectors procured it at about 6,000 feet. (Taken by me at Pashok at 6,000 feet on June 16th, but is not a common species—*H. J. E.*)

693. *C. attenuata*, Moore.

Sikhim and Bhutan. It is found at 3,000 feet in the latter locality in April and May.

Genus Pterodecta, Butl.

694. *P. anchora*, Moore.

Sikhim and Bhutan. I have 3 specimens from Tongloo, 10,000 feet, and one marked 2,000 feet, this latter elevation is probably wrong.

I have however seen it alive at Rissoom, 6,400 feet. (Taken at Tongloo in July—*H. J. E.*)

Family DREPANULIDÆ.

Genus EUCHERA, Hübn.

696. *E. substigmaria*, Hübn.

Sikhim and Bhutan. It is found from the plains' level up to 3,000 feet, and is a most conspicuous object, setting with outspread wings on the under surface of a leaf or on the upper surface in the shade; it is easily disturbed. It is not often attracted to light. The larvæ are velvety black, with the under surface greyish-white; there is a sublateral white line and a lateral row of quadrate elongated yellow and white streaks throughout. It is found in May, June, October and November, in the perfect stage. (Taken at Mongpoo, 3,000 feet, in June —*H. J. E.*)

697. *E. rectificata*, Wlk.

Sikhim and Bhutan. I took several hundreds of this at Rissoom, 6,400 feet, in August, attracted to light, and indeed had great difficulty in preventing them putting my lamp out. Both this and the last species have a most disagreeable smell, caused by a scent gland on the underside of the 1st abdominal segment, the scent of which is diffused by a long fan-like brush which is constantly being expanded. I have also taken specimens at 2,500 feet and 5,500 feet. (One of the commonest moths at light at Darjeeling. I have also taken it on the top of Tongloo. I should not have called the scent of the insect disagreeable. —*H. J. E.*)

Genus MACROCILIX, Butl.

699. *M. mysticata*, Wlk.

Sikhim. I have only one specimen of this in my collection, which I believe was obtained in Darjeeling station. (I found this not uncommon in July and August at Darjeeling and have specimens from Möller dated April.—*H. J. E.*)

700. *M. orbiferata*, Wlk.

Sikhim and Bhutan. I took this on one occasion but have never seen another specimen; mine is now in the British Museum. (I have specimens taken at Darjeeling in May, and in Bhutan in September by Möller's collectors. It occurs also in the Khasia Hills in October, coll. Atkinson.—*H. J. E.*)

Genus Macrauzata, Butl.

701. *M. fenestraria*, Moore.

Sikhim. I have taken this as low as 1,800 feet in January, but it probably occurs at about 15,000 feet more commonly; my other specimen being from Tukvar, taken in March. (I never saw or got this myself, and have one only from Möller, which is much larger than Khasia specimens.—*H. J. E.*)

Genus Auzata, Wlk.

702. *A. semipavonaria*, Wlk.

Sikhim. I have never seen this. (Two specimens only from Möller's collection.—*H. J. E.*)

Genus Ditrigona, Moore.

703. *D. triangularia*, Moore.

Sikhim. I have not seen this species. (Taken at light by me at Darjeeling in June and July.—*H. J. E.*)

Genus Teldenia, Moore.

704. *T. vestigiata*, Butl.

Sikhim and Bhutan from 1,000 to 2,500 feet. This is not uncommon from June to September.

Genus Leucodrepana, Hmpsn.

705. *L. idæoides*, Hmpsn.

Sikhim, 10,000 feet. I have not procured this. (Though I have the type of this and the next two species in my collection, I am not at all sure that I can separate them by the characters given by Hampson. I took this species and *L. obliquilinea*, Hmpsn., on Tongloo with *Drepana quinaria*, Moore, which they much resemble, unless examined minutely.—*H. J. E.*)

706. *L. nivea*, Hmpsn.

Sikhim and Bhutan. I have one specimen taken in the latter locality in June. (The type of this comes from the Khasias, where I took it in September; by some error Sir G. Hampson has published it as from Sikhim.—*H. J. E.*)

707. *L. obliquilinea*, Hmpsn.

Sikhim and Bhutan. I have one specimen from the latter locality, taken in May.

Genus Emodesa, Moore.

707*b*. *E. sinuosa.* Moore.

Sikhim, 1,800 feet. I took one specimen in December in the Balasun valley beaten from dry grass.

Genus Drepana, Schr.

708. *D. pallida*, Moore.

Sikhim and Bhutan. I only possess one male of this species taken in April. (I have three females of this, one of which I identified with Moore's specimen (? type) which are very different from the male which Hampson figures as *D. pallida.* He has labeled one of these females *D. pallida*, var.; they have two round dusky marks larger than the single one in his figure, and placed on the two outer angles of the cell; they have, though quite fresh, none of the yellowish tinge of the male. One from Möller is dated 12th December, another from Knyvett the 2nd March - *H. J. E.*)

709*a*. *D. undulifera* Hmpsn. Jour. Bo. Nat. His. Soc. ined.

Yatung 10,500 feet (*Hobson*).

710. *D. rufofasciata*, Hmpsn.

Sikhim. I have one specimen taken at high elevation in July which is probably referable to this species, its condition is however poor. (The type male is from Möller's collection, the female, which is precisely similar, was taken by me on Tongloo in July.—*H. J. E.*)

711. *D. ochreipennis*, Hmpsn.

Sikhim. I have never received this. (Three specimens of this small very distinct insect from Möller's collection, probably from the interior. —*H. J. E.*)

712. *D. quinaria*, Moore.

Sikhim 7,000—10,000 feet (*Elwes*); Bhutan 3,000 feet (*Dudgeon*). I took three specimens in October at Fagoo which I described as a new species, and which Sir George Hampson says is identical with this species. It differs from the other species of the section in *both sexes having the antennæ pectinated on one side only, the branches in the female being short and the hindwing in both sexes being angled at vein* 4. The neuration corresponds with that of *D. pallida*, Moore. (I took this myself at light on Tongloo in July, and have one from Atkinson's collection marked Darjeeling. This latter named by Moore may be a different species, but is not fresh enough to decide.—*H. J. E.*)

712*a*. *D. fulvicosta*, n. sp.

♂. White; frons and antennæ brownish, the former pectinated on both sides with the branches not very long. Forewing with costal edge pale fulvous, white, crossed by two very indistinct ante-medial, two post-medial and one sub-marginal fuscous waved lines. Hindwing with crenulate indistinct lines in continuation of those of the forewing, the inner ante-medial obsolete and the post-medial slightly angled at vein 4; outer margin angled slightly at vein 4.

♀. Only differs from the male in the antennæ being ciliated.

This species I originally placed under *D. innotata*, Hmpsn., but both Sir George Hampson and Mr. Elwes say that it does not belong to that species. Mr. Elwes remarks that *D. innotata* is pure hyaline white without a trace of markings, and that the antennæ of the female are simple.

Bhutan, 3,000 feet (*Dudgeon*). Two specimens taken by me in October, 1894, at Fagoo. *Exp.*, ♂ 32, ♀ 34 mm. This species superficially resembles *Leucodrepana nivea*, Hmpsn.

714. *D. fasciata*, Hmpsn.

Sikhim. I have not seen this species. (I am doubtful whether this is a *Drepana* at all, but having only a female it is not easy to decide the question.—*H. J. E.*)

715. *D. specularia*, Wlk.

Sikhim, 7,000—10,000 feet. Occurs in July and August. Dr. Pilcher obtained several at light in Darjeeling. (Common at Darjeeling in July and August.—*H. J. E.*)

716. *D. discispilaria*, Moore.

Sikhim, 7,000 feet; Bhutan, 6,400 feet. I have taken this species at light at Rissoom in April, it occurs at Darjeeling in August also. (Rare at light in July at Darjeeling.—*H. J. E.*)

718. *D. muscularia*, Wlk.

Sikhim, 6,800 feet. Appears to be rather scarce. I have one specimen taken at Darjeeling in June. (Commoner than the last. I took several at Darjeeling at light in July and August, and have others from Möller's collection.—*H. J. E.*)

720. *D. lilacina*, Moore.

Sikhim, 1,800 feet. I have one female which I took at Punkabaree in June; the apex of the forewing is extremely falcate, the lines are brownish-fuscous. (A specimen dated April 4th from Knyvett, and another from Möller.—*H. J. E.*)

721. *D. orphnina*, Hmpsn.

Sikhim and Bhutan, 2,500 feet. I have two specimens which I think may belong to this species, they are purplish-grey with several indistinct waved lines on both wings, one ante-medial and one post-medial being most distinct. (This may be *D. prunicolor*, Moore. I do not know whether Sir George Hampson had identified *D. muscularia*, Wlk., when he described *D. orphnina*, but except by the latter's smaller size, I cannot distinguish it.—*H. J. E.*)

722. *D. prunicolor*, Moore.

Sikhim. I have not received this.

723. *D. postica*, Moore.

Sikhim. I have never taken a specimen. (This, which looks a very distinct species as figured, is almost the only species out of 28 recorded from Sikhim which I do not possess.—*H. J. E.*)

724. *D. vinacea*, Moore.

Sikhim. (Rare at Darjeeling where I took one specimen at light in July, I have it also from the Khasia Hills.—*H. J. E.*)

724*a*. *D. leucosticia*, Hmpsn. (PLATE I, FIG. 22, ♂).

Sikhim ; Bhutan, 3,000 feet. This very distinct little species is not uncommon in the Chel valley, and occurs in June and November.

725. *D. fenestraria*, Moore.

Sikhim ; Bhutan, 6,000 feet. I took a single male below Labah in September. I have never seen another specimen. (A single specimen from Möller agreeing with others from the Khasia Hills.—*H. J. E.*)

726. *D. trilinearia*, Moore.

Sikhim. Two specimens in my collection which I had put under this species upon examination prove to belong to Section III, vein 11 arising from the middle of the areole. I cannot identify these with any species described. (A specimen taken by me on the boundary of Nepal towards Sundakphoo, agrees with the type in collection Moore, and with two others from Möller. A specimen named by Sir George Hampson is either a variety with much more purple on the forewing or a different species.—*H. J. E.*)

727. *D. excisa*, Hmpsn. (PLATE I, FIG. 21, ♂).

Sikhim ; Bhutan, 2,500 feet. I took a male at Fagoo in August at light. (This beautiful species is rare in Sikhim. I have it also from the Naga and Khasia Hills.—*H. J. E.*)

728. *D. argenteola*, Moore.

Sikhim, 1,800 feet ; Bhutan, 2,500 feet. The Sikhim specimen is pale ochreous with a conspicuous chocolate bar on the disco-cellulars of the forewing ; the Bhutan one is darker, with two parallel lines across the cell at right angles to the post-medial double line. (I am almost sure that there are two or three species united under this name in the "Moths of India," one which I have named *D. argenteol* from Moore's collection, and which has 4 or 5 distinct bands from the costa to the transverse band, which are not mentioned in Sir George Hampson's description or seen in *D. biocularis*, Moore. I have it from Sikhim and the Khasias. The other, a smaller insect, like Moore's plate of *D. biocularis* but paler in colour, has a distinct dark patch with outer spot in the cell, of which there is no trace in *D. argenteola*, Moore, and the transverse band of the hindwing not coming near the costa, which it touches in *D. argenteola*. I have this from Gammie's and Möller's collections, also from the Khasias and Nagas. A single specimen from Sikhim which to some extent combines the characters of both may be a third species. I cannot identify *D. patrana*, Moore.—*H. J. E.*)

731. *D. duplex*, Moore.

Sikhim, 6,800 feet. One female taken at the electric lamps in Darjeeling in June. (I have a single female taken by Knyvett on May 5th.—*H. J. E.*)

732. *D. specularis*, Moore.

Sikhim. Not received by me. (Also a very rare species. I have one only from Möller.—*H. J. E.*)

733. *D. flava*, Moore.

Sikhim. Not known to me. (I have only one from an old Darjeeling collection, others from the Khasia Hills.—*H. J. E.*)

734. *D. albonotata*, Moore.

Sikhim, 7,600 feet ; Bhutan, 2,500 feet. Two males and one female of this species, the two former procured at the lower elevation in July, the female in December at the higher one. One male is the variety *septempunctata*, Warr. (A pair only from Möller's collection.—*H.J.E.*)

735. *D. sadana*, Moore.

Sikhim ; Yatung, 10,000 feet. I received one specimen which seems referable to this species from the latter locality collected by Mr. Taylor of the Chinese Commission. (I am almost sure I have two species from Sikhim under the name of *D. sadana*. Two males and a female taken by me on Tongloo which have the outer part of the forewing from the apex to the two discal spots and hind-margin chestnut, whilst the others, of which I have a pair taken by Möller's collectors in Bhutan in September, have only a well defined purplish mark on the outer margin below the apex. The antennæ in this form seem to be much less pectinate.—*H. J. E.*)

739. *D. vira*, Moore.

Sikhim. I have not seen a specimen. (I have four from Sikhim and three from the Khasias which agree with Moore's description. I have also two females of what I am almost sure is a distinct species, having no band on the hindwing, no group of silver spots on the forewing, a much more falcate forewing and no transverse bands on either wing below. One of these is marked October 15th by Möller, the other, from Knyvett has been named *D. vira* by Hampson—*H. J. E.*)

740. *D. fulva*, Hmpsn.

Sikhim ; Bhutan. I have one male from high elevation in Bhutan. (The type of this came from near Jongri, about 13,000 feet, Knyvett sent me two others from Gnatong, about 12,000 feet. These are all I have seen.—*H. J. E.*)

741. *D. hyalinata*, Moore.

Sikhim, 6,800 feet. My specimen which was taken at the electric light in Darjeeling in June is not good enough to identify with certainty. (Two specimens only from Möller's collectors, one has been identified with the type in Atkinson's collection. Moore described it as a Geometrid, and it certainly is aberrant in form and markings, and does not go well with *D. fulva*.—*H. J. E.*)

Genus Problepsidis, Hmpsn.

741*b*. *P. albidescens*, Hmpsn.

Sikhim. I have never received another besides the type which is now in the British Museum.

Genus SPICA, Swinhoe.

742. *S. luteola*, Swinh.

Sikhim; Yatung, 12,000 feet. I have one specimen from the last locality taken by Mr. Taylor which appears to be a female, the antennæ are flattened and toothed or lamellate, the extremity of the abdomen has a whitish tuft. (I took both sexes at light at Darjeeling in July and August, and there were many in Möller's collection. I very much doubt whether it is rightly placed after *Drepana*, the claspers of the male furnished with great widespread tufts of down are quite unlike any *Drepana* I know.—*H. J. E.*)

Genus THYMISTADA, Wlk.

743. *T. tripunctata*, Wlk.

Sikhim. I have one specimen without a label which I probably received from a collector in Darjeeling. (This is quite common at light at Darjeeling and at Tongloo in July and August.—*H. J. E.*)

Genus DEROCA, Wlk.

744. *D. hyalina*, Wlk.

Sikhim. I have not seen a specimen. (I expect this is only got in the interior. Sikhim specimens like those from the Naga Hills and Manipur are much smaller than those from the N.-W. Himalayas—*H. J. E.*)

Genus PHALACRA, Wlk.

747. *P. excisa*, Hmpsn.

Sikhim. I do not know this.

Genus DRAPETODES, Guén.

748. *D. mitaria*, Guén.

Sikhim, 1,800 feet; Bhutan, 2,500—3,000 feet. Specimens from these localities would appear to be larger than those examined by Sir Geo. Hampson. The smallest of six specimens in my collection measures 31 millimetres, and the largest 37 millimetres. I have taken it in February, June, October, November and December.

Genus ORETA, Wlk.

750. *O. extensa*, Wlk.

Sikhim, 1,800—7,000 feet. Occurs, but not commonly, in Darjeeling in June. I took a single female at 1,800 feet in November at Punkabaree. (I never got it in Darjeeling. Specimens from Möller are dated March.—*H. J. E.*)

751. *O. sanguinea*, Moore.

Sikhim. I have not seen this. (I have it from Möller and Knyvett, dated April, but never took it myself. I believe it is a low-level moth. —*H. J. E.*)

753. *O. obtusa*, Wlk.

Sikhim. This seems to be a common species at light in Darjeeling, I have specimens taken there in May and August. (Common at light in July and August.—*H. J. E.*)

754. *O. obliquilinea*, Hmpsn.

Sikhim. I have not seen a specimen. (A pair from Möller agree with Mussoorie specimens.—*H. J. E.*)

758. *O. pavaca*, Moore.

Sikhim, 6,800 feet. This occurs at light in Darjeeling in June and July. (Rarer than *O. obtusa*.—*H. J. E.*)

758*a*. *O. olivacea*, n. sp. (PLATE II, Fig. 20, ♂.)

♂. Head purplish; palpi and legs scarlet and grey; hind tibiæ with prominent black stripe; thorax and abdomen olive-brown, the latter tinged with pinkish towards the end. Both wings olive-brown, slightly but evenly striated with silvery-grey scales; an almost medial waved reddish line bent outwardly above the cell and inwardly near the inner margin of the forewing, continued as an indistinct sub-basal line on the hindwing; some reddish suffusion below the costa of the forewing beyond the medial line; a grey lunulate mark on the costa of the forewing before the apex, continued as a very indistinct sub-marginal line as far as vein 5; a black spot near the outer angle of the forewing, cilia of both wings pinkish-brown.

Larva smooth, with the anal somite triangular, with a long single terminal process, and the anal prolegs wanting; 3rd somite with a short curved dorsal hump. Purplish-brown, paler dorsally from the 4th somite to the end; a dark oblique line from the sub-lateral area of the 4th to an indistinct dorsal line on the 7th somite, angled and again oblique down to the sub-lateral area of the 10th somite. Head bifid, produced to two conical points. Food plant, a species of *Erythrina* called in Nepalese "Phalleta."

Pupa, formed in a rolled-up leaf bound with pinkish silk, red-brown with some pinkish powdery excrescences on the head and thorax.

Sikhim, 1,800 feet (*Dudgeon*). *Exp.* 40mm. Types in Brit. Mus. collection and collection Dudgeon. Sir George Hampson remarks that this is allied to *O. griseotincta*, Hmpsn., and *O. berenice*, Swinh., from Singapore.

759. *O. griseotincta*, Hmpsn.

Sikhim, 1,000 feet. I took a single male of this species in September near Punkabaree in the Balasun valley. (Besides the type I have only one male from Darjeeling.—*H. J. E.*)

(*To be continued.*)

THE HILL FORESTS OF WESTERN INDIA.

By H. M. Birdwood, C.S.I., LL.D., M.A., late Vice-President of the Bombay Natural History Society.

Notes of a paper read at the Lecture Hall, Greater Britain Exhibition, Earl's Court, London, on the 4th July 1899, *under the Presidency of General Michael, C.S.I.*

I trust that the following notes of a paper I lately read at the Earl's Court Exhibition will be of interest to the Members of the Bombay Natural History Society. My object was to direct attention to a limited area only in Western India, where the operations of the Indian Forest Department may be regarded as more or less typical of its general work. But, first, I referred to some considerations which determine the applicability of a system of scientific forestry to any particular country, and attempted to trace, in outline, the history of the measures adopted by the Government of India for the Conservancy of Forests in districts where scientific forestry is likely to secure permanent advantages to the people. I also adduced some statistical information which gave an idea of the progress so far made.

It is obvious that, in some parts of the globe, it would be of no advantage at all to increase the existing forest areas or to try to grow forests where no forests have ever yet grown. The increase of vegetation in some countries might indeed be a positive evil to the inhabitants. It might reduce the temperature of the air and of the soil where it is already cold enough for human comfort ; or it might increase the rainfall in sea-bound regions which are damp enough already ; or it might unduly reduce the area of cultivation in thickly populated countries where people are mainly dependent on their own lands and crops for sustenance. Or, again, the afforestation of new lands might not be required for the production of fuel or of materials for building ships or houses, or for railways or machinery, in countries already well supplied with peat or coal or iron or other substitutes for firewood and timber. And, lastly, employment on forest industries might not be a matter of public concern in places where other industries sufficiently occupy the time and intelligence of the people.

But India is not a country where such considerations prevail.

Dr. Schlich, in his admirable "Manual of Forestry," tells us that, as a rule, the nearer we are to the Equator, the more important becomes the Forest question. In a hot country, with distinct wet and dry seasons, forests may be necessary for the mitigation of extreme heat and dryness during a part of the year, and for the regulation of the flow of water in springs and rivers. The climate of a Continental country may be improved by forests ; and a mountainous region is, according to the same authority, more in need of forests than a low-lying country, because forests tend to prevent landslips and avalanches and the washing away of soil from hill sides and the consequent silting up of rivers. Also they check the force and suddenness of destructive floods. In hilly countries, as elsewhere, forests provide protection from storms for men and beasts and birds.

Now India is distinctly a hot country, though in the Northern provinces extreme cold is also felt in winter. It possesses, over a great part of its area, well defined wet and dry seasons, dependent on constant causes recurring from year to year with the process of the sun above and below the equator. Except on the sea-coast, it possesses a continental climate, or rather several types of continental climate ; and though there are vast plains within its boundaries, it is intersected by many mountain ranges, and even its plains and table-lands are broken by isolated hills and hilly tracts. It is a land in which it would be suicidal to neglect the great question of Forest Conservancy.

And yet it is only during the past 50 years that the vital importance of the question has been realized in British India. Early in the present century, a timber agency was indeed established on the West coast; and, in 1839-40 the Government of Bombay prohibited the cutting of teak trees on State lands. In 1843, Mr. Conolly, the Collector of Malabar, made extensive plantations of teak at Nilambur ; but no systematic plan for the maintenance of wooded lands for the supply of timber and other produce, or on account of their beneficial influence on the climate and public health, or for the protection of the soil or human dwellings from the violence of storms, and, in short, no plan for the regular administration of forests on well ascertained principles was adopted till several years afterwards, when the danger of continued neglect could no longer be concealed.

There can be no question that, at one time, a very large part of the earth's surface was covered by forest growth, the destruction of which has been followed by momentous consequences to the drainage of the soil and its external configuration. Local climates have probably also been affected, though such causes as the drainage of marshes and the operations of husbandry are also believed to have contributed to such a result, by altering the hygrometric, thermometric, electric and chemical conditions of the atmosphere. As observed by Mr. George Marsh, in his suggestive treatise on "The Earth as modified by human action," it is but recently, even in the most populous parts of Europe, that public attention has been directed to the necessity for restoring the disturbed harmonies of Nature, whose well-balanced influences are propitious to all her organic offspring, and of repaying to our great Mother the debt which the prodigality of former generations has imposed on their successors. As regards India, the evidence disclosed by ancient writings seems to show that it was covered, to a great extent, at one time by forests. Dr. Schlich thinks that the country was more fertile then than it is now and the climate less fierce; and he refers to the testimony of the great Chinese traveller, Fa-Hian, who described the climate as neither cold nor hot. Subsequently, as settlers began to occupy fertile valleys, forest lands along the banks of the great rivers were more and more cleared for cultivation. Such a proceeding was inevitable; and it would be idle to regard it as an interference with the order of Nature; for so long as it met the actual needs of human beings, it was in aid of those harmonious methods by which during the countless centuries, the Earth has been fitted for human habitation. But man must now take his part in the further development of those methods, if the great end in view is not to be defeated and if successive generations of men are to pass on the inheritance they have enjoyed, not unimpaired merely, but improved to the best of their power. Such a conception of human duty was, however, unknown to the nomadic tribes, who, according to Dr. Schlich, for a period of more than 750 years, carried on the work of destruction, not only in fertile valleys, but alike on hills and plains, as they moved from one pasture ground to another. In his Preface to the Catalogue of the Indian exhibit at the International Forestry Exhibition held at Edinburgh in 1884, Sir George Birdwood says that it was the destruction of vegetation over wide extended areas, at the time of the troubles following the decline of the Moghal Empire, which thenceforward rendered India liable to desolating droughts and the consequent calamity of recurring famines. "In the course of time," says Lt.-Col. F. Bailey, formerly Superintendent of Forest Surveys and Acting Inspector-General of Forests in India, and now Lecturer on Forestry in the University of Edinburgh, " not only were large areas entirely cleared for cultivation and for village sites, but more numerous flocks and herds, driven for their daily food into the jungles, led to the impoverishment of a forest belt of ever increasing width around the occupied tracts." During the hot season, dry grass, fallen leaves and dead wood were set on fire in order to clear the ground for a fresh growth of grass for cattle and also to simplify the pursuit of game. But such practices, with those of over cutting and digging up roots for fuel, soon destroyed the protective forest growth, and heavy rains then washed away the soil. Cows and bullocks could no longer be kept in good condition on the scanty herbage that remained, and the villagers began to keep large flocks of goats, " against whose hoofs and teeth" as Lt.-Col. Bailey remarks, " it is well known that forest growth cannot contend." The village goats are still formidable foes to young plantations, though, in the estimation of Sir Clements Markham, " the uneducated man," in his dealings with forests, goes far beyond the goat in his capacity for mischief.

It would be satisfactory to be able to say that a wiser policy prevailed after the establishment of British Rule. But unhappily that was not the case for many years. " With the advent of British Rule," says Dr. Schlich, " the destruction of the forests became more fierce than ever." The extension of cultivation " at the cost of the still existing forests" was carried out for many years " without any enquiry as to the ultimate effects." With the introduction of railways, a further impetus was given to cultivation in the immediate neighbourhood of railway lines and stations, and with the steady increase of prosperity under a settled Government, the demands for timber and firewood increased enormously throughout the country. And thus the reduction of forest areas went on with all its attendant evils. Lt.-Col. Bailey cites the case of the outer Himalayan spurs in the Hoshiarpur district of the Panjab, where, as the rock is very friable, serious damage has been caused by denudation. Within the memory of living men, these hills were well covered with forests or tall grass, and the hill streams ran evenly in well-defined channels. But the natural vegetation has now almost entirely disappeared, the hills are crumbling away and loose rocks and stones are carried down by the streams, which are often several hundreds of yards wide and deposited in the plains below. "Thus, not only have the hills themselves become a dismal and profitless waste, but the fertility of extensive areas of cultivation near their base has been completely destroyed by the stony deposits laid on them." (Lt.-Col. Bailey on "Forestry in India." *The Scottish Geographical Magazine* for 1897, p. 576.) Similar causes have produced similar effects in other parts of India. The following instance is probably familiar to many members of the Society. Between that great Western ramp of the table-land of the Dekhan—the range of the Sahyadri Gháts—and the sea, there is the narrow hilly tract of the Konkan. Many of the hills of the Southern Konkan were at one time well wooded, and some of the streams were navigable by larger craft than any that can now make their way to the towns and villages on their banks. Here, as elsewhere, disastrous results have followed the destruction of forests. The mould which, in the shelter of the jungle, had been formed, during centuries, on the rocky surface of the hills, to which it had been bound by a living network of fibrous roots, became exposed to the full force of the monsoon rains. The average annual rainfall near the sea amounts to about 80 inches and gradually increases, till about 30 miles inland, at the ridge of the Gháts, which forms the water-shed of the rivers flowing eastwards and westwards, it reaches an average of about 280 inches in the year. A wide view of these Konkan hills is obtained from the Hill Station of Mahableshwar, and I well remember a conversation I once had there with Mr. Shuttleworth, who, like other officers of his Department, was always full of zeal for his work. He spoke in indignant terms of the folly and the mischief of which the evidence lay before us in sun-baked summits and barren sides of hills which, not so very long ago, were clothed with all the glory of tropical vegetation. It is not easy to appreciate all the mischief that has been done. The silting up of water-ways alone means commercial loss to the whole country-side. It means agricultural loss to those from whose possession the soil itself has slid away, past recovery; and the whole community must suffer from the increased cost of fuel and timber.

It was not until the increasing difficulty of meeting demands for public works indicated the existence of a timber-famine, that the Indian Government realized the gravity of the situation. According to Dr. Schlich, the remedial measures at first adopted were only " half-hearted." But when their insufficiency was made clear, a special State Department was organized. The efforts which preceded that event were not, however, unimportant or without effect on subsequent arrangements. Indian Botanists had long urged on the Government the necessity for establishing a regular system of forest administration and preventing the continued destruction of public property of enormous value. The dawning of a new era was marked by the appointment, in 1847, of the late Dr. Gibson to be Conservator of Forests in the Bombay Presidency. The most important duty assigned to him was the maintenance of the supply of teak for ship building to the Government Dockyard in Bombay ; and his work as a pioneer of practical forestry was of special value in Western India, where he was familiarly known as " Daddy Gibson" and is still remembered, with affection, by the people of the Junar district above the Ghats, where he had his head quarters. As early as in 1847, the well known name of the late Dr. Hugh Cleghorn, who has been described as the father of the scientific forestry in India, appears in a report on the proposed conservation of forests in Mysore. In the following year, General Michael, C.S.I., who was then Lieut. Michael of the 39th Madras Infantry, and has been described by Sir Joseph Fayrer as the father and pioneer of practical forestry in India, was entrusted by the Government of Madras with the organization of an establishment for working and conserving the public forests near Coimbatore and Cochin. He opened out forest roads and timber slips down the mountain passes and cleared belts of brushwood to preserve young saplings from fire. In the Anamalai teak forests, he made " the first recorded attempt to protect Indian Forests from injury by annual jungle fires." (Lt.-Col. Bailey on " Forestry in India." *The Scottish Geographical Magazine* for 1897, p. 576.) Also by giving employment to the Hill tribes he secured their co-operation in his plans. In the discussion on the paper on Forestry read by General Michael before the Society of Arts in December, 1894, Sir George Birdwood referred to certain attempts in the same direction made about the same time in

Bombay and Tennaserim, which, however, met with no success, partly because they were on too ambitious a scale, and partly because the ancient forest rights of the people were not sufficiently considered. " General Michael," he said, " set to work in a more modest manner and in a far more conciliatory spirit, and after six years his exertions, which completely broke down his health, were crowned with such success that the Court of Directors in London at once took up the subject warmly, and rapidly extended the Madras system of conservancy all over India." In the same discussion General Michael was referred to by Sir Joseph Fayrer as " certainly one of the great benefactors of India."

No account of Indian Forestry, however summary, would be satisfactory without a reference to his services. It was the enthusiasm, born of a love of woodland life, innate in such men as Dr. Gibson and himself, and the out-of-door experience acquired by them and others, whether as foresters or sportsmen, and interested as such in every phase of forest craft, which really prepared a firm foundation for the stately fabric of scientific forestry raised by their successors.

It was from the City of Edinburgh, with its grand Botanic Gardens and its long array of men of science, prominent among them, in our own time, in connection with much that relates to the science of Forestry being Professors James Hutton Balfour and Bayley Balfour, that the effective impulse was received which determined the further development of the Forest Department. In 1850 the British Association met in Edinburgh and appointed a Committee to consider the probable effects, from an economic and physical point of view, of the destruction of tropical forests. In the following year, the Committee presented at Ipswich a report which embodied the general conclusions and recommendations arrived at, and demonstrated the importance of preserving every condition tending to maintain an equilibrium of temperature and humidity, of preventing the disappearance of indigenous forests, and of taking the requisite steps for extending forest conservancy and ensuring the due and continued supply of valuable forest produce. The weighty evidence adduced by the Committee and the broad views enunciated by them so impressed the Court of Directors that, within a few years, regular establishments were sanctioned for the Madras Presidency and British Burma. In 1856, Dr. Cleghorn took up General

Michael's work, and was appointed Conservator of Forests in Madras, with Capt. Douglas and Lieut. Beddome as his Assistants, who in turn succeeded him in the office of Conservator, after his transfer, first to Bengal, where he gave most efficient aid to Dr. Brandis in carrying out forest conservancy, and afterwards to the Panjab. According to Col. Bailey, Dr. Cleghorn checked the destructive practice of temporary cultivation in the Madras forests, notwithstanding the opposition he encountered. He was ultimately successful "because his well known desire to promote native interests inspired the rulers of the country with confidence in his proposals." In the year 1856 also, Dr. Brandis, (now Sir Dietrich Brandis, K.C.I.E.), was appointed Superintendent of Forests in Pegu, and six years afterwards was placed on special duty with the Government of India. He was the first Inspector General of Forests to the Government of India, and held the office till 1881, when he went on special duty to Madras. His book on "The Forest Flora of North-Western and Central India" is a standard work, greatly prized by Indian botanists and foresters. " From the time of his appointment the successful future of Forest Conservancy in India was assured." (Sir George Birdwood. Preface to the Catalogue of the Indian Exhibit at the International Forestry Exhibition, Edinburgh.)

We owe to Dr. Brandis, among other important services, the suggestions for the various Indian Forest Acts, " which, while strengthening the hands of the Government, have secured to the people the maintenance of all the ancient rights and privileges inherited by them from time immemorial," and also the inauguration, in 1866, of arrangements for the annual supply of trained officers to discharge the duties of Assistant Conservators of Forests in India. At first these officers were educated in France and Germany. In 1876, the student candidates were withdrawn from Germany and stationed at Nancy, under an English officer. In 1885, Dr. Schlich (who had succeeded Dr. Brandis on his retirement) organized the Forest Branch of the Royal Indian Engineering College on its present footing at Cooper's Hill.

While candidates with special qualification for the higher grades of the Forest Department are, with some exceptions, now recruited from England, it is obvious that there must be much important work connected with the executive charge of the Forest "Ranges" comprised in the larger " Divisions", the disposal of which the Government of India must entrust to officers trained in India itself. The class of Forest Rangers has been described as the "back-bone" of the Department. Candidates for this branch of the service are trained at the Imperial School at Dehra-Dun, which is attended by students from all parts of India. A certain number of Forest appointments has also been guaranteed annually by the Government to the students of the College of Science at Poona. A Protective Service of Forest Guards is also employed for the purpose of patrolling forests and ensuring compliance with Forest regulations. The members of this branch of the Service receive no professional training.

The Indian Forest Service, thus organized, has been able not only to meet the demands of India but to help other countries also. Ceylon, New South Wales, New Zealand, the Cape, Mauritius, Jamaica and Cyprus, as General Michael in his paper on Forestry tells us with just pride, have all borrowed officers from India to put them in the way of organizing conservancy and working their forests economically. The Head of the Forest Department at the Cape and the Conservator in Ceylon are both Indian Forest Officers. The United States of America have also recognized the value of the work in India by lately deputing an expert to study the methods there in force.

The forests to which the Indian Forest Act of 1878 is applicable include "Reserved Forests", which are State property or over which the State has certain rights; "Village Forest" assigned or yet to be assigned by the Government to Village communities from Reserved Forest areas; "Protected Forests", which, as regards the proprietary rights of the State, are on the same footing as "Reserved Forests", but are subject to less stringent supervision,—only certain kinds of timber being protected and all private rights of cultivation, pasturage and wood-cutting within the protected area being respected; and lastly, "Private Forests", which are controlled only to such an extent as is necessary for their regulation or protection for certain special purposes. The Forest Department has also the control of State plantations of timber trees.

The area of British India, exclusive of the Native States, is about 960,000 square miles, and of this area more than 79,000 square miles had been constituted as Reserved Forests before the end of the year 1896-97. About 9,000 square miles were "Protected" and nearly 26,000 square miles were tabulated as "unclassed." The total area under the control of the Forest Department amounted, therefore, to about 114,000 square miles, inclusive of about 1,100 square miles leased from Native States. Of this area, which is only about 7,000 square miles less than that of the British Isles—about 32,000 square miles are closed to all animals, and about 41,000 square miles are closed to browsing animals only. I am unable to give any exact statistics as to Village Forests and Private Forests, but it has been estimated that the area of Private Forests and Forests belonging to Corporations, Endowments, etc., is about equal to that of the State Forests, and that the total area of Forests of all kinds is about 25 per cent. of the total area of British India. In Great Britain and Ireland the corresponding percentage is only 4. The corresponding figures for Europe and the United States of North America are 31 and 17, respectively. In European countries the highest percentage is reached in Servia, where it is 43. In Russia and Sweden it is 42 ; in Austria 33 ; in Hungary 29 ; in Germany 26; in Norway 25; and in Turkey, including Bulgaria, Bosnia and Herzegovina, and also in Roumania and Italy, 22. In Switzerland, Spain, France, Greece, and Belgium it lies between 19 and 15. In Holland it falls to 7, in Denmark to 6, and in Portugal to 5, Great Britain and Ireland thus show the lowest percentage of all the countries named, while India comes seventh in the list, being bracketed with Norway. (Schlich's Manual of Forestry, Vol. I., p. 54.)

The area of plantations directly under the Government of India and the Government of Madras is said to extend to 41,000 acres. In the Bombay Presidency, the afforestation of waste tracts has been pushed with vigour, but I am unable to give the acreage. One of the plans adopted by Mr. Shuttleworth, in the Central Division, as he has personally explained to me on the site of some of his operations, on the hills near Poona, has been to sow the seeds of all kinds of forest trees and shrubs broadcast on the ground. The results of the annual sowings have been satisfactory except in seasons when the rainfall has failed at the close of the monsoon. Hill-tops and stony valleys which 20 years ago were bare and unsightly are now well covered with innumerable saplings and most refreshing verdure. Similar results have been obtained on many of the rocky hills of the Dekhan.

The review of Forest Administration in British India for the year 1896-97, by Mr. B. Ribbentrop, C. I. E., Inspector-General of Forests, shows that, in that year, which is the latest for which I have any report, the State forests yielded more than 47 millions of cubic feet of timber, nearly 100 millions of cubic feet of firewood, nearly 135 millions of bamboos, and minor produce to the value of nearly 3¼ millions of rupees.

In the same year, the exports from British India to foreign ports included 64,221 tons of teak wood, valued at nearly 7 millions of rupees; sandal-wood, ebony and other ornamental woods, worth nearly 6,00,000 of rupees; and such minor produce as Caoutchouc, Lac, Lac-dye, Cutch and Gambier, Myrabolams, and Cardamoms, worth about 21 millions of rupees.

The total value of exports, which reached nearly 28½ millions of rupees, was less by 6½ millions than the total value for the preceding year; the decrease being due almost entirely to the disastrous effects of plague and famine.

The gross revenue realized from forests during the year 1896-97 amounting to nearly 18 millions of rupees, the surplus over expenditure having been 8 millions. More than 17 per cent. of the gross revenue represented the estimated value of forest produce given away free or at reduced rates to right-holders and free grantees. When it is remembered that, before 1848, the forest revenue, which was treated as a branch of the land revenue, was very trifling, the progress made in the past 50 years is very remarkable. But, as most truly observed by Sir George Birdwood, in the paper from which I have already quoted, "the annual revenue which forest conservancy has as yet provided is utterly insignificant when compared with the capital value of the Indian forests redeemed by the British Government from certain destruction."

It would be strange if such results had been achieved without opposition. I have already spoken of the conciliatory course adopted by some forest administrators towards those whose privileges were affected by the stringency of the new regulations. Villagers on the outskirts of forests had for generations cut firewood and grazed cattle therein and cleared patches for cultivation without hindrance. The policy aimed at has been to stop the exercise of privileges incompatible with the continued existence of forests, and to allow others as far as possible. But the necessity for a restrictive policy at all, while necessarily distasteful to right-holders, was not readily accepted as right by the local officers of the Indian Civil Administration, with whom it has always been an honourable tradition to seek above all things the happiness and contentment of the people. They were unable to look with favour on measures which seemed to indicate an exceess of zeal on behalf of the State and to be in needless derogation of privileges long enjoyed without much apparent injury to public interests. It has been suggested that, though the accumulated mischief caused by neglect of conservancy during a long series of years is incalculable, yet it is not possible always to detect any appreciable damage done in a particular locality during a short period. Such a consideration alone might partly explain the tendency to reject as idle the fears of experts and to recent measures savouring of harshness and productive of discontent. In course of time, as forest management became stiffened and matured, friction was undoubtedly developed and gave rise to difficulties. One of the purposes of the Forest Act of 1890 was to give effect to recommendations made by Lord Reay's Government for reconciling legitimate local demands with State requirements. The principle is now recognized that the central authority in forest matters, so far as the interests of the people are concerned, must be the Commissioner of the Civil Administrative Division, and that no rivalry between two great State Departments is possible. The Forest Administration has thus been brought into closer union with the general Civil Administration of the country, many causes of complaint have been removed and forest work has been placed on a sounder footing.

The particular area of which I spoke at the beginning of my paper includes the hilly tracts of country on either side of the range of Western Ghâts, in the Dekhan and Konkan, respectively, between the latitudes, roughly speaking, of Bombay and Satara. As compared with other forest areas elsewhere in the Presidency it is by no means remarkable, so far as the production of valuable timber is concerned; but it is of interest as illustrating generally the methods of the Forest Department; and it is of special interests to the inhabitants of Bombay and many other cities in the plains, as it includes the two popular Hill stations of Matheran and Mahableshwar, which owe much of their value as health-resorts to their pleasant woods and abounding undergrowth of beautiful shrubs and flowering plants and ferns which everywhere keep the ground cool and the air sweet and fresh. Both in climate and in splendour of wild woodland scenery they furnish an instructive contrast with those hills of the same tract which have suffered from the destruction of forests in the manner I have already described. An account of the Forest Flora of Matheran and Mahableshwar will apply generally to similarly preserved portions of the Western Ghats and the adjoining regions. Their vegetation is not indeed identical. Dr. Theodore Cooke, in his valuable note on my Catalogue on the Hill Flora of Matheran and Mahableshwar, published in Vol. X of the Society's Journal, has estimated that, exclusive of grasses, about 140 flowering plants are found at Matheran, which have not been seen at Mahableshwar, and 130 at Mahableshwar which have not been seen at Matheran. In the preface to the Catalogue I have shown that some of the conditions which regulate the distribution of plants are not equally operative at both places, and will not here repeat what I have there said. I have also there pointed out that, after full account is taken of all divergences, many plants are found to be common to the two hills, and that such a coincidence is favoured by the practical indentity of their geological formation and by the circumstance that there is no great difference in the range of their mean temperature at different seasons and in their rainfall. A marked similarity is indeed apparent in the general outward forms of vegetation on the two hills, due to the frequent presence of the same characteristic plants on both. Everywhere at Mahableshwar as at Matheran, we find the Myrtle tribe represented by endless woods of the beautiful Jambul tree, (*Eugenia jambulana*), the Melastomas by the Anjan or Ironwood (*Memecylon edule*), the Laurels by the Pisa (*Litsæ Stocksii*), and the Madder tribe by the thorny Gela (*Randia dumetorum*). There is the same undergrowth of shrubs and herbaceous plants, the natural orders of " Leguminosæ," " Acanthaceæ " and " Compositæ " being specially and numerously represented, and there are many showy climbers, trailers and creepers, and orchids and ferns common to both hills.

It is interesting to note that, of the 733 names included in the Catalogue, about 125 are the names of trees or sub-trees, as distinguished from shrubs, creepers, grasses, ferns and undergrowth generally. Of the trees, probably not more than 10 species have been introduced, and about 115 species are probably indigenous. These constitute but a small proportion of the indigenous trees found throughout India, the number of which exceeds 2,000 species, but they give some idea of diversity of forest vegetation in the limited area under consideration, if we bear in mind that the number of species of indigenous trees in Great Britain is only forty. (Lt.-Col. Bailey on "Forestry in India." *The Scottish Geographical Magazine* for 1897, p. 572.)

The trees which have been distinctly introduced are the Peach, which is cultivated at the hill station of Panchgani, the Stringy Bark (*Eucalyptus obliqua*), which does not take kindly to Mahableshwar, the rainfall there being evidently too heavy for it, but does better at Panchgani, though not nearly so well as on the Nilgiri Hills ; the *Cinchona succirubra*, which again has not been a success, as on the Nilgiri hills and elsewhere ; the Cassowary tree or Beefwood (*Casuarina equisetifolia*) which has been extensively planted at Panchgani, but much prefers the lower lands nearer the sea and especially the sandy beaches of the Konkan coast ; the Oak (*Quercus robur*) of which, however there are very few well grown trees ; and the Mulberry (*Morus alba*) which was probably brought from China.

Among the more important or more conspicuous trees which may be regarded as indigenous are two species of *Garcinia*—the wild Mangosteen (*Garcinia indica*) and the Gamboge tree (*Garcinia ovalifolia*) ; the (*Sterculia urens*), from the wood of which native guitars are made ; the Goldar (*Sterculia guttata*), conspicuous by its large peach-shaped fruit, covered with scarlet down ; the Silk-cotton tree (*Bombax malabarica*) which attains a great size and is a tree of strange beauty, when in full bloom, with its large showy, rosy-red flowers ; the Kásu (*Elæcarpus oblongus*), with leaves turning red in autumn and clusters of flowers with white fringed petals, and reddish brown sepals ; the Frankincense tree (*Boswellia serrata*), which is plentiful on the Ghât roads between Poona and Mahableshwar ; and another Balsamiferous tree, the *Canarium strictum* yielding a gum, burnt as incense by the hill people, at their religious services, and much sought after on account of the rarity of the tree, of which I have found only one specimen at Matheran,—to my lasting wonder at its presence there, in a thick wood, far from its congeners and hemmed in by countless aliens ; the *Garuga* *pinnata* (belonging also to the same natural order, *Burseraceæ*) the bark of which is used in tanning; the Indian Satin-wood (*Chloroxylon Sweitenia*), an excellent wood for cabinet work of the better kind, the Indian Red-wood or Bastard Cedar (*Soymida febrifuga*), the bitter bark of which is used as a substitute for Cinchona bark; two species of the Jujube tree (*Zizyphus*); the Koshimb tree (*Schleichera trijuga*), on the young branches of which *lac* is produced in many parts of India; the well-known Mango-tree (*Mangifera indica*), which is found wild on many hills though sometimes said to have been introduced by the Portuguese monks from Brazil; the "Flame of the Forest" (*Butea frondosa*), which gives its name—("Palas" in the vernacular)—to the memorable plains of Palāsi, commonly known as Plassey; the Blackwood tree (*Dalbergia latifolia*) of which is made the elaborately carved furniture, at one time so much prized in Bombay; the beautiful Indian Laburnum (*Cassia fistula*); the *Acacia Suma*, from the wood of which Catechu is manufactured; the Ain (*Terminalia tomentosa*), a valuable timber tree; the Myrobolam tree (*Terminalia Chebula*), which is found in great abundance on Mahableshwar, the fruit—the Chebulic Myrobolam of commerce—being largely exported, coming indeed, for the whole of India, third on the list of exports of forest produce, as regards valuation, and second as regards quantity; the Jambul tree (*Eugenia Jambolana*), already referred to, which may be regarded as the most characteristic tree of both Matheran and Mahableshwar, impressing, as it does most effectually, its grace of form and beauty of colour on all the landscape, and shading the ground everywhere with a cool canopy of sweet-scented leaves; the Benteak tree (*Lagerstrœmia parviflora*), which yields a wood of excellent grain for the cabinet maker; the Kánta Kumbal (*Sideroxylon tomentosum*), a tough, hard-grained tree, as its name implies; the *Bassia latifolia* or Mowrah tree, from which Mowrah liquor is made in other parts of India; and yet a third tree of the Sapodilla order, the Bokul (*Mimusops elengi*), with dark green foliage and honey-scented flower; the *Diospyros assimilis*, one of the Indian Ebonies; the Kaola (*Symplocos Beddomei*), with blossoms scented like hawthorn and blue berries; the wild Olive (*Olea dioica*); the Teak tree (*Tectona grandis*), the most important of all the forest trees; the Shewan (*Gmelina arborea*), the pale yellow, close grained wood of which is used for planking, furniture, the panels of doors, etc. ; the wild Nutmeg (*Myristica attenuata*) ; and fifteen species of trees of the Laurel order, all notable and some of them very beautiful trees, the most notable being *Litsœa Stocksii,* a laurel of pyramidal form with whorls of pale bluish-green leaves and frequent everywhere, and a species of Cinnamon (*Cinnamonum Tamala*)—of which I have found only four specimens, all at Matheran—a striking and handsome tree, though of no great size, with tufts, when first bursting into leaf, of small, pink, transparent leaves, which afterwards lengthen and become pointed at both ends and have marked ribs or nerves, and are dark and shining above, and when dried, turn to a rich brown, and yield a spicy scent, when crushed. These, with several species of trees of the Spurge-wort order (*Euphorbiaceœ*), which is well represented on both hills and includes the *Macaranga Roxburghii*, a tree conspicuous at Matheran by its large ovate and peltate leaves, and the Hasána (*Bridelia retusa*), a good timber tree ; and of the genus *Ficus*, which includes the well known Banyan tree, the sacred Pipal, the Sycamore tree of the Bible, and other Figs not so well known ; the stately and fine foliaged Jack tree (*Artocarpus integrifolia*), with its enormous fruit, allied to the Figs, the Willow (*Salix tetrasperma*), and the Fish-tail palm (*Caryota urens*),—the only palm included in my Catalogue—make up a fairly full list of the more conspicuous of the forest trees on the two hills.

I wished I could have conveyed to my audience something more than a dim conception of the beauty and perennial charm of these Indian woods. But that was beyond my power. It was enough for me, if, by my narrative, however imperfect and meagre, I had helped in any degree, to induce a right appreciation of the value of the great work done by those who had preserved and improved the Forest areas of British India to the lasting benefit of the State and the people.

My paper was illustrated with lantern slides prepared mostly from some beautiful photographs taken many years ago by Dr. Theodore Cooke. I was also able, through the kindness of Mr. Playford Reynolds, to exhibit some specimens of forest woods, which had been selected and polished by Messrs. John Roberts and Company of Bombay, being woods in common use for cabinet work.

DESCRIPTION OF A NEW *ANDROSACE.*
FROM THE NORTH-WESTERN HIMALAYA.
BY J. F. DUTHIE.

(*Read before the Bombay Natural History Society*, *on* 18*th Sept.*, 1899.)

ANDROSACE FRAGILIS, *n. sp.*

Perennial. Whole plant excessively glandular, viscid. Petioles, peduncles and pedicels very slender and brittle. Leaves all radical; petioles $\frac{3}{4}$ to $2\frac{1}{4}$ in. in length ; blade usually broader than long, $\frac{3}{4}$ to $1\frac{1}{4}$ in. wide and $\frac{7}{12}$ to $\frac{3}{4}$ in. from base to apex, sub-orbicular or reniform cordate, deeply lobed, thinly cartilaginous, dark green above, the lower surface reddish-brown turning to bright red, glistening on both surfaces : veins prominent ; lobes extending almost to the centre of the blade, overlapping at their apices, usually 3-crenate. Peduncles far exceeding the leaves, $3\frac{1}{2}$ to $4\frac{3}{4}$ in. long, usually curving upwards from the base, densely clothed with short silky hairs and shorter glandular ones ; pedicels $\frac{3}{4}$ to $1\frac{1}{4}$ in., spreading. Bracts obovate or spathulate, cuneate, often trifid at the apex ; veins distinct. Calyx broadly campanulate, deeply lobed, enlarging in fruit ; lobes oblong or obovate, cuspidate, prominently veined. Corolla slightly exceeding the calyx when in flower, deeply lobed, limb at first pure white, turning pink and afterwards to bright crimson, lobes obovate, bifid ; tube short, globular, greenish. Stamens on very short filaments, attached to the corolla-tube about half way up. Ovary turbinate ; style very short. Capsule subglobose. Seeds about 20, ovate, flattened at the sides, minutely granular.

Jaunsar and Tehri-Garhwál, in the Valley of the Tons and its tributaries, growing in crevices of rocks at elevations between 3,000 and 7,000 feet.

I was at first disposed to look upon this plant as a well-marked variety of the polymorphous *A. rotundifolia* of Hardwicke ; subsequent observations, however, as to its structural characteristics, and its peculiar mode of growth, have convinced me that it should be regarded as a distinct species. At all elevations it maintains its habit of confining itself to the crevices of overhanging rocks, and usually out of the reach of direct sunlight. At the higher elevation, where *A. rotundifolia* becomes abundant, I failed to detect anything at all resembling an intermediate form. It is at once recognized by its small glistening leaves, its minute pure white, pink, and ultimately crimson flowers, its long slender petioles and peduncles, and the spreading pedicels. It is also a very much more viscid plant than any of the known varieties of *A. rotundifolia.*

BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

PART VII.

By C. M. Inglis.

(*Continued from page* 291 *of this Volume.*)

Order *Gallinæ.*

Family *Phasianidæ.*

Genus *Polyplectrum* (Temm., 1813.)

232 *Hume, Cat. No.* 803 *quat.; Blanf. No.* 1327. Polyplectrum chinquis (Müller).—The Grey Peacock-Pheasant.

Native name—Mejoor.

Not very common here. I have only found it in dense jungle, generally on the summits of teelahs. During the five years I was in Hylakandy I seldom secured specimens, but whilst on a visit to Roopacherra in April, 1895, I shot on an average one every morning, during the ten days I was there. Every one I got took me several hours to secure, as the only way I managed to shoot any was by patiently following up its call. They were all killed perching on creepers a few feet from the ground. Out of some twenty or so shot, a single male had on the right leg one spur and on the left two; all three being of the same size.

Sub-Family *Gallinæ.*

Genus *Gallus* (Brisson, 1760.)

233 *Hume Cat. No.* 812; *Blanf. No.* 1328. Gallus ferrugineus (Gmel.).—The Red-Jungle-fowl.

Native name—Jangli Murghi.

Very common indeed. I have often flushed small parties of them from the tea, in the early morning and evening. Several of the Roopacherra coolies used to snare a few every year by the means of decoys. I have hatched numbers of eggs under hens, fed the chicks on white ants, but never succeeded in rearing a single bird.

Genus *Gennæus* (Wagler, 1832.)

234 *Hume, Cat. No.* 810 *ter*; *Blanf. No.* 1339. Gennæus horsfieldi (G. A. Gray).—The Black-breasted Kalij Pheasant.

Native name—Modúra.

Fairly common. At Roopacherra, there was a place where one or two could generally be found. It was a patch of young tea surrounded on three sides by a jungle and through it flowed a stream. In dense jungle I have generally come across it in the moist land bordering on the streams. They are very pugnacious. Once I winged a female, she got into the jungle on the slope of a teelah. It was very steep and I sent a man to catch the bird. No sooner had he caught her than the cock came rushing at him, he made a thrust at it but couldn't hit it, the bird then retired, but only to renew the attack a second time. It did this three or four times whilst the man was bringing down its mate, in the end I shot it also. The Bengalis here keep decoy birds, but though on one occasion I offered ten or fifteen rupees for a trained one, the man would not part with it. They breed here in April.

Genus *Excalfactoria* (Bonap., 1856.)

Hume, Cat. No. 831 ; *Blanf. No.* 1354. EXCALFACTORIA CHINENSIS (Linn.). —The Blue-breasted Quail. 235

Common here. I have had its eggs brought to me, several times, but not collecting at that time I did not keep any and cannot find any record of the dates on which they were brought.

Genus *Coturnix* (Bonn., 1790.)

Hume, Cat. No. 830 ; *Blanf. No.* 1356. COTURNIX COROMANDELICA (Gm.).—The Black-breasted Quail. 236

Scarce. I have only seen it occasionally.

Genus *Arboricola* (Hodgson, 1844.)

Hume, Cat. No. 820 ; *Blanf. No.* 1365. ARBORICOLA ATRIGULARIS (Blyth). —The White-Cheeked Hill-Partridge. 237

I have not found this partridge common here, and have never seen more than a couple of pairs together. It is generally found in deep jungle, but I have flushed a single bird on several occasions in thin jungle that had an undergrowth. Here it breeds in April.

Native name —Titir.

Genus *Francolinus* (Stephens, 1819.)

Hume, Cat. No. 823 ; *Blanf. No.* 1376. FRANCOLINUS GULARIS (Temm.)—The Swamp Partridge. 238

I never secured this species myself, but Mr. Ross got several in *ekre* and *nall* jungle near the Lallamukh Tea Estate. Mr. Hole found it breeding in March in Western Cachar.

Native name —Bhil Titir.

Order *Hemipodii.*

Family *Turnicidæ.*

Genus *Turnix* (Bonn., 1790.)

Hume, Cat. No. 832 ; *Blanf. No.* 1382. TURNIX PUGNAX (Temm.)—The Bustard-Quail. 239

This species is resident here.

Order *Grallæ.*

Sub-order *Fulicariæ.*

Family *Rallidæ.*

Genus *Hypotænidia* (Reich., 1852.)

Hume, Cat. No. 913 ; *Blanf. No.* 1389. HYPOTÆNIDIA STRIATA (Linn.)—The Blue-breasted Banded Rail. 240

Rather common. Mr. Hole has found it breeding in Western Cachar.

Genus *Amaurornis* (Reich., 1852.)

Hume, Cat. No. 911 ; *Blanf. No.* 1398. AMAUORNIS FUSCUS (Linn.)—The Ruddy Crake. 241

Rather uncommon I fancy ; but as both Rails and Crakes are such skulkers numbers must be overlooked.

242 *Hume, Cat. No.* 907 ; *Blanf. No.* 1401. AMAURORNIS PHŒNICURUS (Penn.)—
Native name —Dauk. The White-breasted Water-hen.

Exceedingly common.

Genus *Porphyrio* (Brisson, 1760.)

243 *Hume, Cat. No.* 902 ; *Blanf. No.* 1404. PORPHYRIO POLIOCEPHALUS (Lath.) —The Purple Moorhen.

Native name —Kaim. Near the Bengali busties, on the opposite side of the river, at the Roopacherra ghat, there is a stretch of land which during the rains has a good deal of water in it ; here, I have several times flushed and shot this species in the thick reeds and paddy that surrounded the place. I had a pair of tame birds which used to roam about near my bungalow. They would jump up at the women who came to pluck the tea bushes that surrounded the bungalow and chase them for a good distance, every now and then flying up at them.

Family *Gruidæ.*

Genus *Grus* (Pallas, 1766.)

244 *Hume, Cat. No.* 863 ; *Blanf. No.* 1409. GRUS ANTIGONE (Linn.)—The Sarus.

Mr. Stuart Baker in Vol. XII, No. 3 of this Journal, on page 494, mentions having once seen a pair of these cranes near Hylakandy during the cold weather of 1894.

Order *Limicolæ.*

Family *Parridæ.*

Genus *Metopidius* (Wagler, 1832.)

245 *Hume, Cat. No.* 900 ; *Blanf. No.* 1428. MOTOPIDIUS INDICUS (Lath.)—The Bronze-Winged Jacana.

Native name —Pipi. Exceedingly common.

Genus *Hydrophasianus* (Wagl , 1832.)

246 *Hume, Cat. No.* 901 ; *Blanf. No.* 1429. HYDROPHASIANUS CHIRURGUS (Scop.) —The Pheasant-Tailed Jacana.

Native name —Ram Mekou. Rather scarce and only found in the rains. My few specimens were secured where I got those of *Porphyrio poliocephalus.*

Family *Charadriidæ.*

Sub-Family *Charadriinæ.*

Genus *Sarcogrammus* (Reich., 1852.)

247 *Hume, Cat. No.* 855 ; *Blanf. No.* 1431. SARCOGRAMMUS INDICUS (Bodd.)—The Red wattled Lapwing.

I have seen several of this species in the district.

Genus *Microsarcops* (Sharpe, 1896.)

248 *Hume, Cat. No.* 854 ; *Blanf. No.* 1434. MICROSARCOPS CINEREUS (Blyth).—The Grey-headed Lapwing.

I have not secured any specimens, but Mr. Primrose has got several in the adjoining district and it is pretty sure to be found here.

Genus *Hoplopterus* (Bonap., 1831.)

HOPLOPTERUS VENTRALIS (Wagl.)—The Spur-winged Lapwing. 249

Hume, Cat. No. 857 ; *Blanf. No.* 1435. I have found this species rather rare here.

Genus *Charadrius* (Linn., 1766.)

Hume, Cat. No. 845 ; *Blanf. No.* 1439. CHARADRIUS FULVUS (Gmel.).—The Eastern Golden Plover. 250

One year they were exceedingly common here. On some damp ground between Cutleecherra-Kookicherra I came across a large flock. They were very tame, and on being disturbed, the whole flock rose together, giving a very easy shot in the brown.

Genus *Ægialitis* (Boie, 1822.)

Hume, Cat. No. 849 ; *Blanf. No.* 1447. ÆGIALITIS DUBIA (Scop.).—The Little Ringed Plover. 251

I did not secure many specimens ; they were all got at the same place where those of *H. chirurgus* were secured.

Sub-Family *Hœmatopodinæ.*

Genus *Himantopus* (Brisson, 1760.)

Hume, Cat. No. 898 ; *Blanf. No.* 1451. HIMANTOPUS CANDIDUS (Bonn.).—The Black-winged Stilt. 252

Not very uncommon here.

Genus *Totanus* (Bech., 1803.)

Hume, Cat. No. 893 ; *Blanf. No.* 1460. TOTANUS HYPOLEUCUS (Linn.).—The Common Sandpiper. 253

Very common.

Hume, Cat. No. 891 ; *Blanf. No.* 1461. TOTANUS GLAREOLA (Gmel.).—The Wood Sandpiper. 254

Also very common.

Hume, Cat. No. 892 ; *Blanf. No.* 1462. TOTANUS OCHROPUS (Linn.).—The Green Sandpiper. 255

Very common.

Hume, Cat. No. 894 ; *Blanf. No.* 1466. TOTANUS GLOTTIS (Linn.).—The Green Shank. 256

Exceedingly common.

Genus *Tringa* (Linn., 1766.)

Hume, Cat. No. 885 ; *Blanf. No.* 1474. TRINGA TEMMINCKI (Leister).—Temminck's Stint. 257

Very common in the cold weather.

Sub-Family *Scolopacinæ.*

Genus *Scolopax* (Linn., 1766.)

Hume, Cat. No. 867 ; *Blanf. No.* 1482. SCOLOPAX RUSTICULA (Linn.).—The Woodcock. 258

Exceedingly rare. Mr. Ross, of the Lallamukh Tea Estate, has flushed and shot them several times in shady corners of the tea. He also shot another I believe at Jringmara, in the Bheel, which specimen is now in Mr. Primrose's collection.

Genus *Gallinago* (Leach., 1816.)

259 *Hume Cat. No.* 871 : *Blanf. No.* 1484. GALLINAGO CŒLESTIS (Frenzl.).—The Common Snipe.

Native name— Khasa-Kúchi. Very common. In North Cachar, near Dooloo, a wisp of snipe was annihilated by a hailstorm. It was rumoured that as much as two maunds of dead birds were collected next morning by the coolies' and bustie-wallahs and sold in the neighbouring bazaars. An account of this was given in "*The Englishman*" at the time of the occurrence.

260 *Hume, Cat. No.* 870 ; *Blanf. No* 1485. GALLINAGO STENURA (Kuhl.).—The Pintail Snipe.

In March and April good shooting can be had with comfort on grass lands. Mr. Laing, of Rupacherra, told me that he had several times seen young snipe, so I dare say some breed here.

261 *Hume, Cat. No.* 872 ; *Blanf. No.* 1487. GALLINAGO GALLINULA (Linn.).—The Jack Snipe.

My friend Mr. Ross told me that he had once shot a jack snipe at Lallamukh.

Genus *Rostratula* (Vieill., 1816.)

262 *Hume, Cat. No.* 873 ; *Blanf. No.* 1488. ROSTRATULA CAPENSIS (Linn.).—The Painted Snipe.

Very common. Both Mr. Baker and Mr. Hole have kindly given me eggs of this species taken in Cachar.

Order *Gaviæ.*

Family *Laridæ.*

Sub-Family *Larinæ.*

Genus *Larus* (Linn., 1766.)

263 *Hume, Cat. No.* 981 : *Blanf. No.* 1490. LARUS RIDIBUNDUS (Linn.).—The Laughing Gull.

Mr. Baker, in Vol XII, No. 3, p. 501, of this Journal, mentions a gull of this species procured by me in Hylakandy. I never got a second one.

Sub-Family *Sterninæ.*

Genus *Hydrochelidon* (Boie, 1822.)

264 *Hume, Cat. No.* 984 ; *Blanf. No.* 1496. HYDROCHELIDON HYBRIDA (Pall.).—The Whiskered Tern.

Exceedingly common here.

265 *Hume, Cat. No.* 984 *bis.*; *Blanf. No.* 1497. HYDROCHELIDON LEUCOPTERA (Meisner and Schinz.).—The White-winged Black Tern.

I find I have identified a Tern as this species, but will re-examine the skin to see whether it is correct or not.

Genus *Sterna* (Linn., 1766.)

Hume, Cat. No. 985 ; *Blanf. No.* 1503. STERNA SEENA (Sykes).—The Indian River Tern. 266

Not so common as *H. hybrida.*

Order *Steganopodes.*

Family *Phalacrocoracidæ.*

Genus *Phalacrocorax* (Brisson, 1760.)

Hume, Cat. No. 1005 ; *Blanf. No.* 1526. PHALACROCORAX CARBO (Linn.).—The Large Cormorant. 267

Very rare here. A single specimen was shot by a collector near Rupacherra.

Native name—Pan-Kowa or Kowri.

Hume, Cat. No. 1007 ; *Blanf. No.* 1528. PHALACROCORAX PYGMÆUS (Pall.).—The Little Cormorant. 268

Exceedingly common. I have always found them very tame.

Sub-Family *Plotinæ.*

Genus *Plotus* (Linn., 1766).

Hume, Cat. No. 1008 ; *Blanf. No.* 1529. PLOTUS MELANOGASTER (Penn.)—The Snake Bird. 269

Rather scarce. I shot one at Rupacherra during a flood.

Order *Herodiones.*

Sub-Order *Ciconiæ.*

Family *Ciconiidæ.*

Genus *Leptoptilus* (Lesson., 1831)

Hume, Cat. No. 915 ; *Blanf. No.* 1551. LEPTOPTILUS JAVANICUS (Horsf.).—The Lesser Adjutant. 270

Fairly common in certain parts of the district. I used to see numbers of them between Lallamukh and Kalacherra in any marshy land. I have always found them very wary birds.

Native name—Garúr.

Genus *Anastomus* (Bonnaterre, 1790.)

Hume, Cat. No. 640 ; *Blanf. No.* 1553. ANASTOMUS OSCITANS (Bodd.).—The Open-bill. 271

I have found this species rare here.

Sub-Order *Ardeæ.*

Family *Ardeidæ.*

Genus *Ardea* (Linn., 1766.)

Hume, Cat. No. 924 ; *Blanf. No.* 1554. ARDEA MANILLENSIS (Sharpe).—The Eastern Purple Heron. 272

Common here during the rains, but very difficult to get a shot at, except on the wing. Breeds here.

Native name—Iorá-khaná.

Genus *Herodias* (Boie, 1822.)

Hume, Cat. Nos. 927, 927 *bis* ; *Blanf. No.* 1561. HERODIAS GARZETTA (Linn.).—The Little Egret. 273

Common.

Genus *Bubulcus* (Bonap., 1854.)

274 *Hume, Cat. No.* 929 ; *Blanf. No.* 1562. BUBULCUS COROMANDUS (Bodd.).—The Cattle Egret.

Exceedingly common.

Genus *Ardeola* (Boie, 1822.)

Native name—Gai-boglá. *Hume, Cat. No.* 929 ; *Blanf. No.* 1565. ARDEOLA GRAYI (Sykes).—The Pond Heron.

275 The commonest species of this family.

Genus *Butorides* (Blyth, 1849.)

Native name—Kana-boglá. *Hume, Cat. No.* 931 ; *Blanf. No.* 1567. BUTORIDES JAVANICA (Horsf.).—The Little Green Bittern.

276 Fairly common near well-wooded streams. I have several times shot it far in dense jungle.

Genus *Nycticorax* (Rafin., 1815.)

Hume, Cat. No. 937 ; *Blanf. No.* 1568. NYCTICORAX GRISEUS (Linn.).—The Night Heron.

277 Very rare here. I once shot a couple at dusk, but that is the only time I ever saw any. Mr. Primrose came across a colony of them either near the Bagh-o'-Bahar or Iringmara Tea Estates in the Chutla Bheel.

Genus *Ardetta* (Gray, 1842.)

278 *Hume, Cat. No.* 934 ; *Blanf., No.* 1571. ARDETTA SINENSIS (Gmel.).—The Yellow Bittern.

A rare bird. A single specimen shot at Rupacherra during a flood. I have had a pair sent to me by Mr. Primrose from the adjoining district, the Chutla Bheel.

279 *Hume, Cat. No.* 933 ; *Blanf., No.* 1572. ARDETTA CINNAMOMEA (Gmel.).—The Chestnut Bittern.

Native name—Lál-boglá. Very common. It is often flushed from the drain that runs through the tea. I have taken its eggs in July.

Genus *Dupetor* (Heine and Reuhen., 1890.)

280 *Hume, Cat. No.* 932 ; *Blanf., No.* 1573. DUPETOR FLAVICOLLIS, (Lath.).—The Black Bittern.

Rather uncommon. I have shot it during the day in a stream, on one bank of which was dense jungle and on the other cultivated land. Most of the birds I have seen, however, have been in dense jungle, far away from the open.

Order *Anseres*.

Family *Anatidæ*.

Sub-Family *Anserinæ*.

Genus *Anser* (Brisson, 1760.)

281 *Hume, Cat. No.* 945 ; *Blanf., No.* 1579. ANSER FERUS (Schaeff.).—The Grey Lag Goose.

Native name—Ráj-Háns. A female was shot by my collecting coolie, with a charge of S. G., in a paddy field near our polo ground at Rupacherra.

Genus *Casarca* (Bonap., 1838.)

Hume, Cat. No. 954 ; *Blanf., No.* 1588. CASARCA RUTILA (Pallas.).—The Ruddy Sheldrake. 282

Very rare here. I only once saw a few birds. They came to the jheel, where *Æ. dubia* were got, at dusk, and were always away again before sunrise. Native name—Baloo-Háns.

Genus *Dendrocycna* (Swainson, 1837.)

Hume, Cat. No. 952 ; *Blanf., No.* 1589. DENDROCYCNA JAVANICA (Horsf.). —The Whistling Teal. 283

Exceedingly common. Young birds reared by hand get exceedingly tame. Native name—Sharel and also Horali

Genus *Nettopus* (Brandt, 1836.)

Hume, Cat. No. 951 ; *Blanf., No.* 1591. NETTOPUS COROMANDELIANUS (Gmel.).—The Cotton Teal. 284

I have not shot many of this Teal in the district.

Genus *Chaulelasmus* (Gray and Bonap., 1838.) 285

CHAULELASMUS STREPERUS (Linn.).—The Gadwall.

Probably found in suitable places.

Genus *Nettium* (Kaup., 1829.) 286

Hume, Cat. No. 964 ; *Blanf., No.* 1597. NETTIUM CRECCA (Linn.).—The Common Teal.

Have seen a few birds in the cold weather.

Genus *Dafila* (Leach., 1824.)

Hume, Cat. No. 962 ; *Blanf., No.* 1600. DAFILA ACUTA (Linn.).—The Pintail. 287

I have never shot any of this species here, but have seen them flying over.

Genus *Querquedula* (Stephens, 1824.)

Hume, Cat. No. 965 ; *Blanf., No.* 1601. QUERQUEDULA CIRCIA (Linn.).— The Garganey Teal. 288

I have shot several birds of this species whilst in Hylakandy. I have no records of any other ducks or teal from the district, but expect most of such species, as *M. penelope*, *S. clypeata*, *N. rufina*, and *N. ferruginea* are to be found here at times.

Order *Pygopodes.*

Family *Podicipedidæ.*

Genus *Podicipes* (Lath., 1790.)

Hume, Cat. No. 975 ; *Blanf., No.* 1617. PODICIPES ALBIPENNIS (Sharpe).—The Dabchick. 289

I have very seldom this species here, but I find I have recorded a pair seen in a stagnant pool in the district.

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THE BIRDS OF THE ANDAMAN AND NICOBAR ISLANDS.

By A. L. Butler, F.Z.S., M.B.O.U., ETC.

Curator, Selangor State Museum.

(*Continued from page* 571 *of this Volume.*)

Part III. (*With a Plate*).

1188. Ninox obscura, Hume. Blanf., III, p. 311; "Str. Feath.," II, p. 153.

Hume's brown hawk-owl is extremely plentiful in the Andamans, though, like most nocturnal birds, difficult to procure. On fine still nights I often heard as many as a dozen hooting at the same time. The note is a low "whoo-wuk" or "coo-whoop," a soft clear flute-like sound, precisely the same as the note of *Ninox scutulata* in Ceylon. (*Affinis*, the Andaman race of *scutulata*, has an entirely different call.)

They frequent the same trees night after night, and are especially vociferous just after dusk and before dawn. They are generally met with singly; I only once saw two together on the same tree. They are not very shy birds; once or twice I walked up to within three or four yards of one sitting on a low post before it flew. Their food seems to consist principally of beetles. I got a fair series of this hawk-owl, six good specimens being the result of numerous moonlight stalks.

It has also been obtained in the Nicobars.

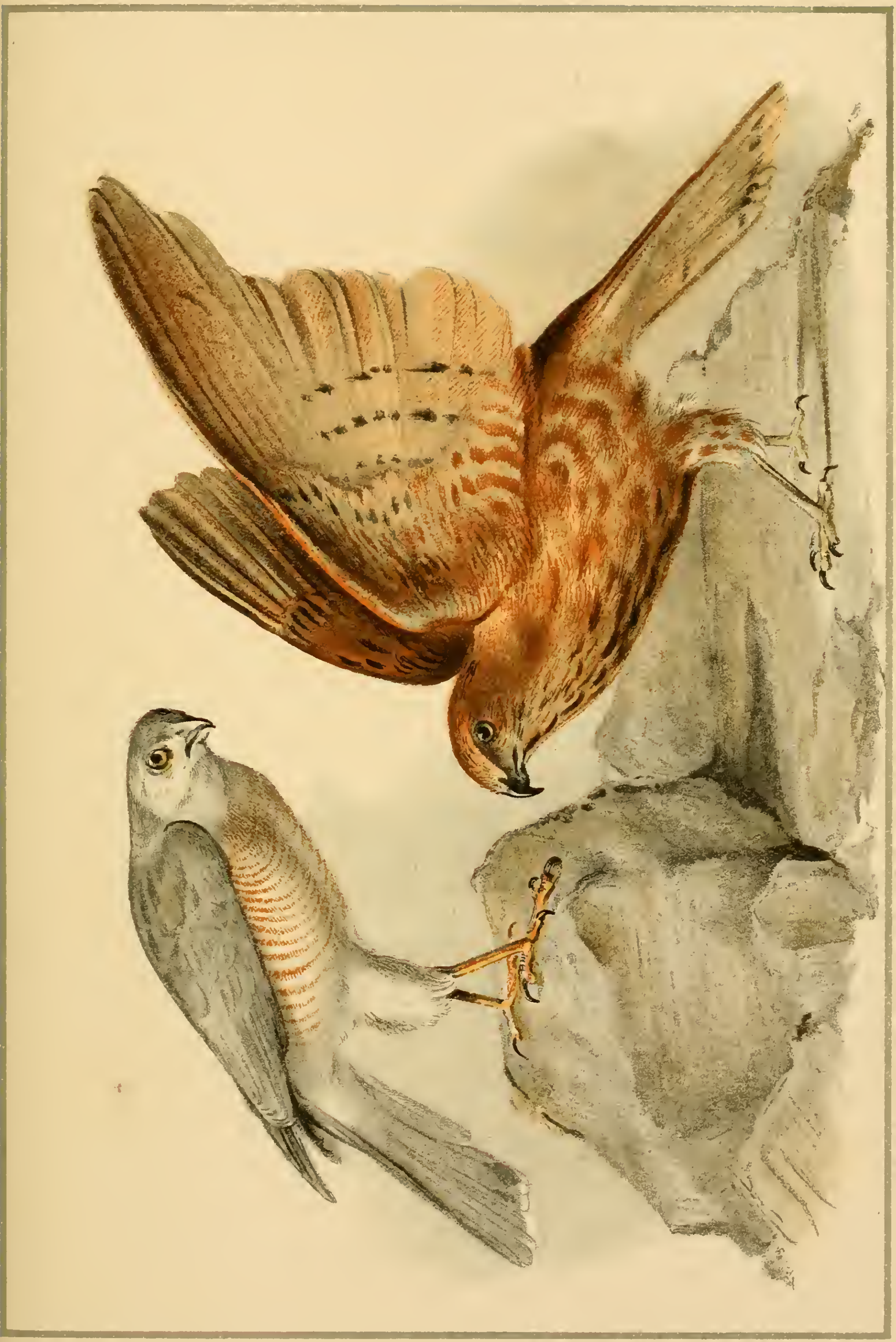
1212. Spizaëtus limnaëtus, Horsf. Blanf., III, p. 351; "Str. Feath.," II, p. 142.

The insular race of this hawk-eagle (*S. andamanensis*, Tytler) is met with throughout the Andamans, but is not common, though hardly rare. Mr. Hume only obtained a single specimen during his collecting trip in the islands, and I only succeeded in getting one example, being unlucky in two or three times getting easy shots at the bird quite unexpectedly when I had only No. 8 or dust shot in my gun.

It is a bold bird, frequently taking a chicken or a pigeon close to a bungalow. I saw one capture a myna (*A. tristis*) and came on another, making a meal off a Koel.

1217. Spilornis cheela, Latham. Blanf., III, p. 357; "Str. Feath.," II, p. 147.

This snake-eagle is a common bird in the Andamans, and has been met with also in the Nicobars. According to Mr. Hume, it is much less common than *S. elgini*, to which it is quite similar in habits. It seemed to me, if anything rather more numerous than *S. elgini*, and I found that snake-eagles shot along the mangrove creeks feeding on crabs were nearly always *S. cheela*, while birds shot on clearings, &c., more inland were usually *S. elgini*. In this species,



ASTUR (SCELOSPIZIAS) BUTLERI. *GURNEY.*

too, Andaman birds belong to a small race, *S. davisoni* of Hume, with wing 14 to 15·5 inches.

1218. SPILORNIS MINIMUS, Hume. Blanf., III, p. 361; "Str. Feath.," I, p. 464.

A miniature snake-eagle, with wing of 11·5 only, occurring only in the Nicobars, where it does not seem to be numerous. Mr. Hume procured two specimens during his trip in 1873. I saw the bird twice, on Teressa and Katchall, but failed to get a shot at it.

1219. SPILORNIS ELGINI, Tytler. Blanf., III, p. 361; "Str. Feath." II, p. 144.

Common in the Andamans. It frequents clearings in the forest, hill sides with scattered trees, &c., and is less often met with in the mangrove swamps than *Spilornis cheela*, being much less partial to crabs than that species. Mr. Hume's party did not meet with this bird in the Nicobars, but Blanford says a specimen from that locality is in the British Museum.

1224. HALIAËTUS LEUCOGASTER, Gmel. Blanf., III, p. 368; "Str. Feath., II, p. 149.

Common all along the coasts of the Andamans, Nicobars, and Cocos, but wary and hard to get within shot of. Immature birds are noticeably less shy than adults. One or two old birds round Ross, however, having become used to people and boats, were comparatively fearless, flying low over the bungalows and jetty, and sitting on a buoy or flagstaff until closely approached.

One of these birds twice swooped down on a fish being trailed thirty yards behind a boat as a bait for cocari, lifting the fish and line clear of the water and then dropping it.

I was told that some years ago one seized a white duck from the garden of a bungalow on Viper Island and flew off over the harbour with it. On its passing a boat in which some one was returning from snipe-shooting, a shot was fired at it, which caused it to drop the duck some four hundred yards from land, the intended victim promptly swimming for home which it reached unnoticed by sharks and little the worse for its adventure. Car Nicobarese—"muttayeya.

1229. MILVUS GOVINDA, Sykes. Blanf., III, p. 374; "Str. Feath." II, p. 150.

Mr. Hume includes the kite in his list, as two were once shot at Port Blair, though, as he points out, these were doubtless brought down on the rigging of a ship from Madras or Calcutta.

1234. CIRCUS CINERACEUS, Montagu. Blanf., III, p. 383.

Early in May I watched for some time an immature harrier, which, I think, belonged to this species, beating backwards and forwards over a piece of swampy ground near Port Blair. It passed me two or three times within seventy yards, but would not come near enough to allow me to shoot it and identify it with certainty. About the same time I found a skeleton of a harrier, which must, I think, have been that of a Montagu's or a Pale Harrier, the feet being far too small for *Circus æruginosus.*

1237. CIRCUS ÆRUGINOSUS, Linn. Blanf., III, p. 387; "Str. Feath.," II, p. 150.

The marsh harrier is scarce in the neighbourhood of Port Blair, without being exactly rare. I saw it about half-a-dozen times in September and October, and shot a fine adult male on February 2nd. Davison says it remains as late as May. It is not likely to occur in other parts of the islands away from the paddy land.

1245. ASTUR SOLOENSIS, Horsf. Blanf., III, p. 400; "Str. Feath.," II, p. 141.

The "Novara" Expedition obtained a single example of this bird on Car Nicobar. I can find no other record of its occurrence in the islands. Mr. Hume did not meet with it; I kept a keen look-out for it, especially on Car Nicobar, which I worked very thoroughly, but I saw nothing of it. My search, however, resulted in the discovery of the next species.

ASTUR BUTLERI, Gurney. Bull. B. O. C., Vol. VII, p. xxvii; Blanf., Birds, IV, p. 486.

I obtained four specimens of this beautiful new species on Car Nicobar in September. The following notes, taken from my diary, were written when I had the birds under observation daily.

Astur, sp. n.? Not uncommon in forest on Car Nicobar, but extremely shy and difficult to shoot. It keeps almost exclusively to the topmost branches of the tallest trees, continually uttering a shrill little double cry, exactly like *Astur badius.* The first *two* birds that I shot (including the only female) lodged dead on the tops of inaccessible trees. Subsequently I shot four more, two adult and two immature males. Young birds are extremely chesnut in colour, looking on the wing as red as, or redder than, kestrels. One or two filaments of nest-down adhering to the feathers of one of the immature birds show that this chesnut plumage is the first acquired. Young birds have a trick of fluttering on a bough exactly like a broken-legged bird, probably a trick practised when they are just out of the nest to first catch the eye of the old bird bringing food.

This hawk probably breeds twice in the year; in September numerous chesnut-coloured birds, bred probably in February or March, were about, while both adult males were in a state of breeding; and I found one nest, about 40 feet from the ground, at the end of a horizontal branch of a huge *Ficus,* in which the birds were apparently just about to lay, as one or both were always seated on the branch near it. Had I remained a few days longer on the island I should probably have obtained the eggs. The stomach of one of the males contained a lizard.

Measurements taken in the flesh :—

♂ ad., Length, $11\frac{3}{4}$; wing, $6\frac{5}{8}$; tail $5\frac{1}{2}$: tars. $1\frac{3}{4}$; Bill at *g.* $\frac{7}{8}$.
♂ ad., „ $11\frac{3}{4}$; „ 7 ; „ $5\frac{1}{2}$; „ $1\frac{3}{4}$; „ $\frac{13}{16}$.
♂ juv., „ $11\frac{3}{4}$; „ $6\frac{9}{16}$; „ $5\frac{1}{2}$; „ $1\frac{13}{16}$; „ $\frac{7}{8}$.
♂ juv., „ $12\frac{1}{4}$; „ $6\frac{7}{8}$.

Iris, bright orange ; feet, yellow : cere, pale greenish : bill, pale bluish horny, tip dusky.

♂ Juv., Iris, greyish-white ; feet, pale lemon ; bill, black, base bluish : cere, pale green ; eyelid, greenish. Car Nicobarese name "Kadéva."

1247. ACCIPITER NISUS. Blauf., III, p. 402 ; "Str. Feath.," IV, p. 280.

A male was obtained by Captain Wimberley in the Andamans in October, 1876. With regard to the distribution of this species I may here mention that I have seen a specimen killed in Perak, preserved in the State Museum at Taiping. Mr. Blanford does not mention its occurrence in the Malay countries.

1248. ACCIPITER VIRGATUS (Reinw.) Blanf., III, p. 404 ; "Str. Feath.," II, p. 141.

Both in the Andamans and Nicobars the Besra is extraordinarily scarce. I saw it about three times only during my stay ; Mr. Hume's party in 1873 secured only one specimen.

1254. FALCO PEREGRINUS, Tunst. Blanf., III, p. 413 ; "Str. Feath.," II., p. 140.

The Peregrine only occurs in the Andamans as a rare straggler. I only saw it once, in Port Blair harbour in January, when a falcon passed over me in the evening just out of shot.

1265. TINNUNCULUS ALANDARIUS, Gmel. Blanf., III, p. 248.

Captain Orchard told me that he watched an unmistakeable kestrel hovering over some grassy hills at Port Blair in October.

MICROHIERAX LATIFRONS, Sharpe. Blanf, II., p. 434.

This falconet is said to have occurred in the Nicobars, but Blanford says the evidence is at second hand, and the record can hardly be accepted without further proof.

1276. OSMOTRERON CHLOROPTERA, Blyth. Blanf., IV, p. 10 ; "Str. Feath., II," p. 258.

Abundant in both groups. Davison saw a bird building in May, and a bird which I shot during that month was apparently breeding.

1284. CARPOPHAGA ÆNEA, Linn. Blanf., IV, p. 19 ; "Str. Feath., II," p. 260.

Common in the Andamans, but not so abundant as the next species is in the Nicobars. Breeds about May.

1285. CARPOPHAGA INSULARIS, Blyth. Blanf., IV, p. 20 ; "Str. Feath." II, p. 262.

Very numerous in the Nicobars, on some islands simply swarming

1289. MYRISTICIVORA BICOLOR, Scop. Blanf., IV, p. 23; "Str. Feath.," II, p. 264.

A common resident in the Nicobars: to the Andamans, the Great Cocos, Barren Island and Narcondam, according to Hume, a seasonal visitant. As Davison remarks, it is not so generally distributed throughout the Nicobars as *C. insularis.* Davison also remarks that where the birds had a choice they seemed to prefer the mangrove swamps to the thick forest. A strikingly handsome bird, it associates in large flocks, and fifty or sixty dashing with a clatter of wings out of a tall tree, their black and white plumage showing up vividly against the background of green foliage, are a sight to gladden the eyes of a naturalist wandering in these steamy jungles. Though one would hardly think it, their boldly pied coloring of jetty black and cream-colour is more or less protective. On the wing they are, of course, conspicuous, but among the shifting lights and shadows of a thickly leaved tree on which the sunlight is falling, they are extremely hard to make out. Often I have known a flock were in the branches above me, and yet perhaps only one bird on the outside of the tree with the light shining on its white breast would be visible.

Their note is a chuckling 'hu-hu-hu!'

In his paragraph on its distribution, I see Mr. Blanford quotes Dr. Maingay as stating that this pigeon only occurs on the islands down the coast of the Malay Peninsula. This is incorrect; it certainly keeps principally to the small islets off the coast, but only this week I shot three and saw several more at Kuala Selangor on the mainland of the Peninsula.

Car Nicobarese—"Kaluia."

1290. CALŒNAS NICOBARICA, Linn. Blanf. IV, p. 24; "Str. Feath.," II, p. 271.

Occurs throughout the Nicobars, and is also a rare straggler to the Andamans and Cocos.

These pigeons breed in thousands on the small uninhabited and rarely visited island of Batti Malve, south of Car Nicobar. Mr. Hume's party landed on the island on March 16th, 1873, and he gives a most interesting account of the breeding colony ("Str. Feath.," ii, 95 and 271). Mr. Hume was unfortunately too late for eggs, all the nests at that date containing young, in some cases only just hatched and in some fully fledged. One egg was obtained, but apparently not much of a specimen, as it was preserved by cutting a hole at the side and placing it near an ant's nest. Nearly every thick tree contained several nests; on one Mr. Davison counted as many as thirteen. He describes them as regular pigeon's nests, merely a platform of sticks very closely (loosely ?) and carelessly put together and with no lining of any kind.

My own experience of the Nicobar Pigeon is confined to the island of Car Nicobar, where I came across it pretty often in August and September. I found it very shy and difficult to shoot. It is quite silent so that you have no means of knowing of its whereabouts: creeping through the jungle you are startled by a tremendous flutter of wings overhead and get just a glimpse of a large dark bird with a short white tail disappearing on the wrong side of at least two thick trees. You may have time to get in the snappiest of snapshots and it *may* be effective; mine generally were *not*, though occasionally the report would be followed by a cheery thud. Fortunately one does sometimes get easy sitting shots and opportunities of observing the birds fairly closely, but these are not often.

I usually came across them singly or in parties of three or four to a dozen or so. When feeding on the ground the *Calœnas* walks about much like a large Emerald Dove, but carries its wings much lower, often, indeed, drooping them so much as to give one the idea of their being injured at the shoulder.

When not feeding they sit silent and alert on some bare horizontal bough about thirty or forty feet from the ground; seen thus they look very dark in colour, almost blackish, as, indeed, they generally do when seen in the shade.

Their flight is swift and very strong, though heavy-looking; the flutter they make in leaving a tree is peculiarly loud and characteristic, so that I could always tell by ear whether a bird flying out over my head was a *Calœnas* or one of the common Imperial pigeons.

When settling in a tree above one the clumsy way in which they pitch and commence slowly walking along a thick bough has something rather fowl-like about it; an impression which their large, heavy bodies and long legs tend to increase.

From the crops of the birds I killed on Car Nicobar I took quantities of small seeds, but only of two kinds, one rather like a small prune stone, so hard as to be almost unbreakable, and one much resembling a sunflower seed.

There was a large proportion of very young birds on Car Nicobar in August, many with the head still covered with tiny quills: as they do not breed on Car these must have left the nesting place on Batti Malve, and crossed the nineteen miles of sea which separate the two islands, at a very early age.

The hackles of this pigeon are so long and delicate that when a freshly killed bird is carried by the legs they reverse and droop downwards around its head in a shining canopy of feathery curves.

Words fail to describe the beauty of this glorious pigeon. The lean, game-looking, iron-grey head and neck, the streaming ruff of long glittering hackles, the heavy body and strong broad wings of lustrous metallic green, changing in every light and set off by the square snow-white tail, all combine to make it one of the loveliest of known birds.

Never shall I forget my first *Calœnas*!

1291. CHALCOPHAPS INDICA, Linn. Blanf., IV, p. 26; "Str. Feath.," II, p. 269.

The beautiful little bronze-wing is common in both groups of islands. In the Nicobars, Davison found it breeding in February and March.

1303. ALSOCOMUS PALUMBOIDES, Hume, Blanf., IV, p. 39; "Str. Feath.," II, p. 263.

This fine pigeon is comparatively scarce in both groups. Mr. Hume seems to have observed it in considerable numbers at Macpherson's Straits.

I only shot it once on Car Nicobar, and unfortunately the bird went bad before I could preserve it. It seemed to me more of a Wood Pigeon than a Fruit Pigeon; my bird rose either from the ground or from a low branch within a foot or two of it—far lower than I have seen a *Carpophaga* settle.

1308. TURTUR TIGRINUS, Temm. Blanf., IV, p. 44; "Str. Feath.," II, p. 269.

Mr. Hume includes the Malayan Spotted Dove in his list on the strength of a specimen brought to Blyth from the Nicobars by Captain Lewis. Mr. Hume, however, in another place suggests the possibility of some of Captain Lewis's Burmese and Nicobar specimens having got intermixed. The Nicobar locality seems to me unreliable.

1309. TURTUR CAMBAYENSIS, Gm. Blanf., IV, p. 45.

I found the Little Brown Dove not uncommon at Port Blair on cultivated ground. It may have been introduced at some time after Hume's visit, but I could obtain no information on this subject.

1311. ÆNOPOPELIA TRANQUEBARICA, Herm. Blanf., IV, p. 47; "Str. Feath.," I, p. 269.

Davison notes this dove as 'exceedingly rare' in the Andamans twenty-five years ago. It is now quite common, and I have seen scores collected together in a field where grain was lying about. I took a nest with two eggs in May.

1313. MACROPYGIA RUFIPENNIS, Blyth. Blanf., IV, p. 50; "Str. Feath.," II, p. 266.

Common in both groups. One often flushes it from the ground in clearings, gardens, and even thick jungle. I have often seen it passing over head at a great height on the way to its feeding or roosting grounds.

Davison says that they appeared to him to live 'exclusively on the small Nepal, or bird's-eye, chilli.' I examined the crops of about a dozen, but never found a chilli in any one of them. I noted the contents of the crops of four, as follows:—

(1). Crop full of a small hard round black seed, about the size of a No. 1 shot. I bit open one or two of these and they had a white nutty kernel, which caused a slight, but distinct, irritation in the mouth, lasting for some minutes.

(2). Crop contained 39 green berries, looking very like large boiled peas, (3). Had been feeding on a long green fruit an inch in length with another inch of stalk attached.

(4). Same as (2).

It is curious that *all* Davison's birds, and *none* of mine, contained chillies.

1354. EXCALFACTORIA CHINENSIS, Linn. Blanf., Birds, IV, p. 112.

The Blue-breasted Quail does not seem to have been recorded previously from the islands, but I found it fairly common on one or two small grassy plains on Car Nicobar. As usual, they were very hard to flush in the long grass, and I found the best way of securing specimens was shooting over a rope dragged by two boys. Nicobarese specimens of this quail have the back much suffused with the blue-grey of the breast, and have the pale haft stripes on the back entirely, or almost entirely, wanting. Dr. Hartert and Mr. Blanford refer them to the Sumatran subspecies, *E. lineata.* If this species ranges to the islands from Sumatra, it is curious that it should be comparatively common on the northern island of Car Nicobar, while in the central group neither Mr. Hume's party nor I ever met with it. Soft parts and measurements of a pair of Nicobarese specimens.

♂. Length, $5\frac{1}{2}$; wing, $2\frac{11}{16}$; tail, $\frac{7}{8}$; tarsus, $\frac{13}{16}$; bill at g., $\frac{15}{32}$, at f., $\frac{3}{8}$.

Iris, crimson ; *legs,* orange ; *claws,* black ; *bill,* black, base bluish horny.

♀. Length, $5\frac{3}{4}$; wing, $2\frac{3}{4}$; tail, $\frac{15}{16}$; tarsus, $\frac{13}{16}$; bill at g., $\frac{15}{32}$, at f. $\frac{3}{8}$.

Iris, brownish-red ; *legs,* orange ; *claws,* brown ; *Bill,* dusky bluish.

Car Nicobarese " mul."

1375. FRANCOLINUS PONDICERIANUS, Gm. Blanf., IV, p. 139.

Indian Grey Partridges were turned out near Aberdeen about ten years ago ; though not yet very numerous, they have established themselves well, and one can be sure of flushing a few near Aberdeen and Navy Bay. They breed in May.

1381. MEGAPODIUS NICOBARIENSIS, Blyth. Blanf., IV, p. 147 ; " Str. Feath.," II, p. 276.

Davison says that the Megapod is found on all the islands of the Nicobar group, appearing to be more numerous on those islands where the soil is somewhat sandy, and consequently the undergrowth less dense, as on Trinkut, Treis, etc.

I am inclined to think that on Car Nicobar, on which I spent six weeks, and which I worked very thoroughly it does *not* occur now-a-days, whatever it may have done five and twenty years ago. I found no traces of any mounds, and the Nicobarese declared that it was not met with on Car, though it occurs on Batti Malve within twenty miles.

Mr. Hume saw what he took to be mounds of this bird on Table Island off the Great Cocos, and the light-house keeper had apparently shot them there.

They appear to breed throughout the greater part of the year ; Mr. Hume obtained a large series of eggs in March, and the birds were breeding when

I visited the Nicobars in August and on a subsequent visit of the 'Elphinstone' in February.

The mounds of this bird are almost always placed near the shore, a few yards inside the edge of the jungle. The object of this is to obtain a mixture of the rich leaf mould of the forest with the fine pulverised coral of the beach.

All sorts of vegetable rubbish are accumulated, some of the mounds in time reaching an enormous size; Davison says that on the coast they average 5 feet high and 30 feet in circumference, but that he saw one which must have been at least 8 feet high and 60 feet in circumference.

Davison found that the eggs are laid at considerable intervals, the next egg in the ovary of a bird which had just laid being no bigger than a pea. The egg laid might have been the last of the clutch, but the enormous size of the eggs in proportion to that of the bird, and the fact that they are found some fresh and some on the point of hatching in the same mound, quite bear out Davison's opinion.

The eggs when laid are clayey pink; as incubation progresses they become a buffy stone-colour, and before hatching pale brown or dirty coffee-colour. Mr. Hume gives the average measurements of 62 as 3·25 × 2·07.

Apparently sometimes one pair of birds and sometimes two or three use the same mound, 20 eggs having been taken together from a large heap.

The small mound that I examined was made in the hollow centre of a large tree between the roots, which divided into four large buttresses. It was not more than 2 feet high and 4 feet in diameter, and probably belonged to only one pair of birds. It contained one fresh pink egg, buried at about two feet below the surface. Fermentation in this mound had hardly commenced, the temperature inside being hardly higher than that of any of the surrounding sand. The heap looked more like a lot of rubbish drifted in between the tree roots than the usual nest of the bird.

Davison says: "The eggs are usually buried from 3½ to 4 feet deep, and how the young manage to extricate themselves from the superincumbent mass of soil and rubbish seems a mystery; most probably they are assisted by their parents, if not entirely freed by them."

I think that the young always work their way to the surface quite unaided. For one thing the birds could never know—with eggs in different stages of incubation in the same mound—when to dig down to save a newly hatched young one from suffocation; further the eggs can be hatched by packing them in a box in the material of the mound in which they are found, and Mr. E. H. Man, who hatched a chick in his verandah by this means, told me that it not only extricated itself from the sand, but *flew up* on to the verandah railing directly it was approached.

Old birds take to trees like jungle fowl. Mr. Hume describes their note as a cackling 'kuk-a-kuk-kuk' quickly repeated. A few have been turned out in the Andamans, but nothing more was seen of them.

It is surprising that the Megapod seems to hold its own in spite of the regular destruction of its eggs, the breeding places being mostly known to the Nicobarese and regularly plundered ; yet the birds are from all accounts not much less numerous than formerly.

I have not included the Peafowl in my list. Mr. Hume has it as an introduced species, but though numerous at some of the farms and villages in the settlement, they are all more or less domesticated and appear neither to spread nor increase greatly.

NOTE.—Since I wrote the above Lieut. St John, Commanding R. I. M. S. Elphinstone, has published in this Journal some interesting notes on the Megapod, (Vol. XII, No. 1, p. 212), and in the same paper gives the fullest account yet published of the Narcondam Hornbill.—[A. L. B.]

1385. TURNIX ALBIVENTRIS, Hume. Blanf., IV, p. 154 ; "Str. Feath.," II, p. 281.

The Nicobar Button Quail is common on those of the Nicobar Islands that have undulating plains of grass land. On Teressa I saw more than anywhere else, and on Camorta it is fairly numerous. On Car Nicobar, where there are only a few large open patches of grass, it is not plentiful, being considerably out-numbered by the little Blue-breasted Quail.

Its habits are those of other small button quails. I procured a young bird in August that was probably bred in June or July. It is difficult to get good specimens of this quail, as they rise within a few feet from the rank waist-high grass, whirr along for twenty-five yards or so only, and then drop again to be seen no more unless you have a dog. However after some trouble I managed to get some perfect skins.

It has been obtained in the Andamans, but there it is extremely rare.

1390. HYPOTŒNIDIA OBSCURIOR, Hume. Blanf., IV, p. 162 ; "Str. Feath.," II, p. 302.

Common in both groups, but a very skulking bird and seldom flushed. It frequents forest a good deal, as well as paddy-land, marshes, &c., and I caught several in thick jungle in traps set for for *Euryzona canningi.* The power of hiding themselves which these rails have is extraordinary ; on one occasion I saw one fly to, and settle in, a small patch of tussocky grass not ten yards square and surrounded by bare dried mud, with no other cover for thirty yards. Making sure of this bird I beat the little patch over and over again ; I then searched most carefully among the roots until I had trodden the whole patch completely flat, but never a sign of that rail did I see again. There were a lot of crab holes among the tussocks, and I imagine he must have got down one of these. The note of this rail is a deep croak very like that of the Chesnut Rail. One often hears this deep croak in the grass or paddy within a few feet, but it is only now and again that one can without a dog, put up a bird.

This rail breeds more or less throughout the year. I have known of nests in June, July and November in the Andamans, and took a nest on Car Nicobar on August 30th. I also caught several very small chicks of this species in September and October. The nest is a mere pad of grass, &c., placed anywhere in thick grass or herbage, either in the open or in jungle; the eggs, 7 or 8 in number, are pinkish stone-colour, spotted and blotched with brownish-red of two shades, dark and light, with a few underlying markings of greyish-purple. One egg, among a normally marked clutch, was *white*, sparingly spotted with pale purplish-grey and a few spots of purplish-brown, all the markings on this rather handsome variety being very small. Five eggs measured $1\frac{7}{16} \times 1\frac{1}{16}$; $1\frac{7}{16} \times 1\frac{1}{16}$; $1\frac{3}{8} \times 1\frac{1}{16}$; $1\frac{3}{8} \times 1\frac{2}{32}$; $1\frac{3}{8} \times 1\frac{1}{16}$.

The chick is covered with black down; iris greyish-brown; bill blackish; legs and feet dark brown. The first feathers which appear are the grey feathers of the breast. When caught the chick keeps up an incessant plaintive call note, half whisper and half whistle.

1393. PORZANA PUSILLA, Pall. Blanf., IV, p. 165; "Str. Feath.," II, p. 301.

The pretty little Baillon's Crake is very rarely met with in the Andamans, though, perhaps, it is not really uncommon. I only came across it once, when I found a pair frequenting the rank herbage growing round a stagnant pool near some cattle sheds. One of the birds was swimming along on the filthy ink-black water, jerking its tail like a little water-hen. I beat the cover through and shot one, a beautiful little specimen, but the other gave rather a long shot and with a ·410 bore only I managed to miss it. Their flight is more quail-like than that of any other small rail I know.

Davison only met with it once, at Port Mouat.

1397. RALLINA CANNINGI, Tytler. Blanf., IV, p. 169; "Str. Feath.," II pp. 302 and 500; Hume and Marsh., 'Game Birds,' II, p. 241.

In 1874 Mr. Hume wrote: "This large and handsome rail is either excessively rare or else conceals itself so effectually as to be very seldom seen. . . . We never saw the bird, and Davison, who made special exertions to secure a specimen, only once caught sight of it."

I did my best to learn all I could about this lovely rail while I was in the Andamans. For six weeks after my arrival I saw nothing of the bird, though I kept the keenest look-out for it. Then one morning I was standing on a narrow muddy track in thick jungle and had just changed my gun for a butterfly net, when I saw one of the much-sought rails standing in the path not more than eight yards off, looking at me intently. I stretched my hand out to the convict behind me and clicked my fingers for my gun, but just as I got hold of it the rail was off into cover. And the right barrel was loaded with the lightest charge of dust shot, that would have killed him beautifully at the distance! Next morning I revisited the same place, but saw nothing of my friend; however I noticed some footprints on the mud which struck me as too small for *Erythra phœnicura*, so I spent the morning in running a long low barrier of sticks and branches through the jungle for fifty yards, leaving open four or five small arches, in each of which I suspended a noose. Feeling pretty confident that if *Rallina canningi* came against this fence in his morning's walk he would follow it along looking for an opening and get into the nearest noose, I then went off to breakfast. It rained heavily all the afternoon, and I was feeling very seedy with a touch of fever, but I dragged myself off to look at the nooses, and there, to my delight, drowned and draggled in the mud was *R. canningi* at last, with a noose so tight round his neck that I had to cut it to get it off. He certainly looked very disreputable indeed, but clean water and plaster of Paris worked wonders and he turned out a beauty. After this success I lengthened the fence and put in a few more nooses; I at once caught a second specimen, but after this I was constantly finding the nooses broken, the beaten down mud and leaves and a few rich chesnut feathers showing that a rail had been trapped, but had presumably effected its escape. On these occasions I noticed other footmarks about the place, too large for *R. canningi* or *E. phœnicura*, and with five toes—made in short by the Burmese convict mahouts in charge of the Forest Department elephants working near the spot. As there was not much use in snaring birds for convicts to eat, I had to give up this particular spot.

On my return from the Nicobars in September I set myself to work to try to get a good series of this rail. At every likely spot in the jungles for some distance round I put down one of these fences with nooses, and a most killing trap they proved. Altogether in about two months I captured about 80 of these splendid rails, the only big series ever obtained, excepting a dozen specimens which Mr. Hume received subsequent to his visit from Captain Wimberley. All these birds were killed within one square mile, showing how numerous the species really is. During this time the nooses also caught about 150 white-breasted waterhens; blue-breasted rails, 15 (including two chicks in down); jungle-crows, 23; bronze-winged doves, about 30;—and 1 large toad. Many other birds were also taken from the traps by pigs and jungle-cats (*Paradoxurus andamanensis*), and a number were destroyed by ants in spite of my going the rounds twice a day. I found that thin water-cord fishing-line, waxed stiff to keep the required position and then oiled slightly to make it run well, made the most excellent nooses, exceedingly strong, and very quickly made.

I kept two or three of these rails in captivity for some time. With their rich glossy chesnut upper plumage, contrasting with the broad black-and-white bands of the flanks and lower parts, their bright green bills and beautiful ruby eyes, they are certainly the handsomest bird of the family in Asia. They carry themselves rather high on their legs, the head generally rather drawn in, the feathers nearly always more or less ruffled up, the barred flank plumes over and outside the wings, their whole outline being very round and ball-like. When not alarmed they pace about in a very slow and deliberate fashion, now and then picking up a morsel of food with a quick peck. One bird was so tame that within an hour of its capture it came and took grasshoppers and worms quite fearlessly from my fingers, and pecked and nibbled at my hands when the insects were finished. But as a rule they are shier, though they feed well from the first. They drink a great deal and require plenty of water. In drinking they seemed to me to raise the head much less than most birds, drinking steadily for many seconds without lifting the bill at all. The call note of this bird is a curious deep croak, sounding something as if a man were trying to say " kroop ! kroop ! " with his mouth under water ! I have often heard it within twenty or thirty yards of me in tangled thickets of rattan and *pandanus*, but never have I had a glimpse of the bird, except on the one occasion above mentioned, and once when one fluttered across a path in front of me in the dusk of the evening. The alarm note uttered by a snared bird when approached is a sharp " chick ! chick !" and when caught it sometimes utters a cry rather like that of a wounded rabbit.

The Red Rail feeds principally on beetles, grasshoppers, worms, small snails, caterpillars, &c. In the case of large grasshoppers the prey is held in the bill and shaken as a terrier would do a rat, flung down, pounced on, and worried again until nearly dead and then swallowed. This treatment seems specially meted out to grasshoppers ; the bird apparently considering that a lively grasshopper vigorously 'flicking' its hind legs after being swallowed might not be *very* comfortable for the swallower !

The young bird, which I have not seen described, differs from the adult in having the chesnut parts duller, and the lower parts dark grey with a chesnut tinge, *narrowly banded and streaked* with dirty white, instead of black broadly barred with pure white as in the adults.

Bill dusky olive, legs and feet olive-green, iris reddish-brown or orange-brown.

The chicks, judging from fragments of nestling down which I noticed all over a very young bird, must be beautiful little things, covered all over with rich chesnut down, slightly greyish under the wings ; iris probably brown ; bill dusky olive.

In adult birds the bill is bright apple-green, turning to whitish at the tip ; this green colour is so delicate that it gives the bill, which is hard and strong, the appearance of being soft and weak ; the legs are olive-green ; the iris is beautiful clear scarlet, in some just mottled with the smallest specks of gold round the pupil.

This rail, as far as is known, does not occur in the Nicobars.

(*To be continued.*)

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

PART VII.

By Sir G. F. Hampson, Bart., F.Z.S., F.E.S.

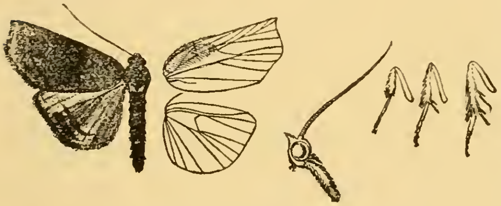
(*Continued from page* 485 *of this Volume.*)

Genus Omphalobasis.

Omphalobasis.—Hmpsn. Trans. Ent. Soc., 1896, p. 525.

Type.—*O. chalybopicta*, Warr.

Palpi down-curved, about two and a half times length of head, the 2nd and 3rd joints thickly fringed with hair above and below; maxillary palpi triangularly scaled; frons rounded; antennæ of male somewhat thickened and flattened; tibiæ fringed with rough hair. Forewing with the costa arched at base, then straight, the apex produced and acute; the outer margin highly excurved from below apex to vein 3; vein 3 from before angle of cell; 4·5 from angle; 6 from upper angle; 7, 8, 9, 10 stalked; male with a glandular swelling at base of costa below fringed with long hair. Hindwing with the outer margin nearly straight from apex to vein 2; veins 3, 4, 5 from angle of cell; 6, 7 stalked.



Omphalobasis chalybopicta ♂ $\frac{1}{1}$.

4579*b*. Omphalobasis chalybopicta. Warr., A. M. N. H. (6), xvii, p. 452.

♂. Dark olive-brown, slightly mixed with ochreous, and with a purplish tinge. Forewing thickly irrorated with chalybeous scales; an obscure slightly curved oblique antemedial band without metalic scales on it, and obscure patches at upper and lower angles of cell; a submarginal band with chalybeous edges, slightly excurved at middle, and with a large rufous patch on its inner side below costa; a chalybeous marginal line. Hindwing ochreous; the basal and inner areas suffused with fuscous; a large triangular olive-brown patch on medial outer area irrorated with chalybeous scales and traversed by metallic-edged submarginal and marginal rufous lines. Underside with the outer half of both wings suffused with fiery red.

Habitat.—Khásis. *Exp.* 36 mm.

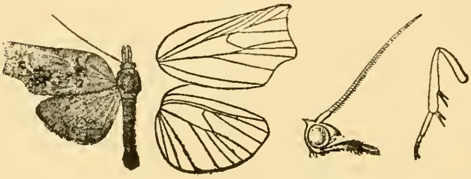
Genus Xenomilia.

Xenomilia.—Warr., A. M. N. H. (6), xvii, p. 458 (1896).

Type.—*X. humeralis*, Warr.

Range.—Assam.

Palpi down-curved, extending about twice the length of head, and fringed with scales above and below; maxillary palpi filiform; frons with sharp tuft; antennæ laminate, with the basal joint long; tibiæ smoothly scaled. Forewing of male with the costa very strongly lobed at base, then nearly straight; the apex produced and acute; the outer margin strongly falcate at vein 3, female with the costa and outer margin evenly curved; vein 3 from before angle of cell; 4·5 from angle; the discocellulars highly angled; 6, 7, 8, 9 stalked, 7 being given off nearer the apex than 9; 10, 11 free. Hindwing with vein 3 from near angle of cell; 4·5 from angle; 6, 7 stalked.



Xenomilia humeralis ♂ $\frac{1}{1}$.

4579*c*. Xenomilia humeralis, Warr., A. M. H. N. (6), xvii, p. 459.

♂. Dull yellowish-rufous; abdomen ochreous and fuscous. Forewing with two waved fuscous antemedial and two similar submarginal lines. Hindwing yellowish with the inner and outer area fuscous. ♀. With the ground-colour of forewing pale ochreous; the two antemedial lines rufous; the outer half of wing dark rufous obscuring the postmedial lines, the inner edge of this area excurved between veins 5 and 2; hindwing uniform fuscous.

Habitat.—Khásis. *Exp.* 34 mm.

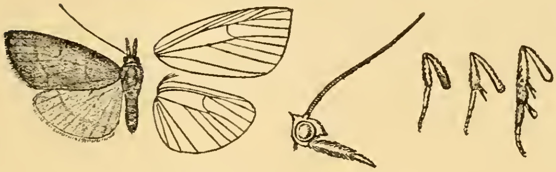
Genus Heterocrasa.

Heterocrasa.—Warr., A.M.N.H. (6), xvii, p. 459.

Type.—*H. expansalis*, Warr.

Range.—Assam.

♀. Palpi down-curved, extending about three times length of head and thickly scaled; maxillary palpi minute; frons with a sharp tuft; antennæ of female almost simple; tibiæ and tarsi moderately scaled; vein 3 from before angle of cell; 4·5 from angle; 6, 7, 8, 9 stalked, 7 being given off just beyond 9; 10, 11 free. Hindwing with veins 3 from well before angle of cell; 4, 5 separate; 6, 7 stalked.



Heterocrasa expansalis ♀ $\frac{1}{1}$

4579*d*. HETEROCRASA EXPANSALIS, Warr., A. M. N. H. (6), xvii, p. 459.

♀. Flesh pink irrorated with darker red and fuscous. Forewing with the costa ochreous; indistinct dark ante- and postmedial nearly straight lines, and a dark discocellular speck. Hindwing paler, with indistinct curved ante- and postmedial fuscous lines approaching each other towards anal ayle.

Habitat.—Khásis. *Exp.* 34 mm.

4595*a*. PARACTENIA PELLUCIDALIS, Warr., A. M. N. H. (6), xvii, p. 460.

♂. Olive-grey; head and collar tinged with ochreous. Forewing with broad medial whitish band edged by the sinuous white ante- and postmedial lines, with three black and white costal specks on it, a black discocellular speck, and a patch of olive and fuscous suffusion below the cell. Hindwing with similar narrower band rather before the middle; both wings with prominent marginal series of black specks.

Habitat.—Khásis. *Exp.* 20 mm.

4614*a*. BOSTRA FERRIFUSALIS, n. sp.

♂. Head and thorax dark ferruginous-red; abdomen pale reddish. Forewing pale reddish; the basal half suffused with dark ferruginous; the outer half irrorated and the veins streaked with dark ferruginous; the outer half of costa with a series of pale specks; an incurved dark medial line bounding the dark area; a black discocellular lunule; an oblique postmedial dark line obtusely angled outwards on veins 4 and 1 and inwards on vein 2; a dark line at base of cilia which are purplish-pink. Hindwing pale, the inner half suffused with red, and with a slightly waved dark postmedial line; cilia purplish-pink, with a dark line at base, *Habitat.*—Khásis. *Exp.* 20 mm. *Type*—In Coll. Rothschild.

4627*a.* TYNDIS EREBALIS, n. sp.

♀. Black-brown; palpi, vertex of head, and base of abdomen tinged with fulvous. Forewing uniform. Hindwing slightly paler. Underside of forewing with the costal fold and extremity of veins streaked with rufous; both wings with fine pale marginal line.

Habitat.—Khásis. *Exp.* 26 mm. *Type*—In British Museum.

4631*a.* MIXOPHILA XANTHOCASIS, Meyr., Trans. Ent. Soc., 1897, p. 81. (Pl. A, fig. 8).

Differs from *M. renatusalis* in the male having a small tuft of red scales in the cilia of hindwing near anal angle; the inner area suffused with ochreous scales below. Forewing with the medial line not expanding into a spot on inner margin; the apical part of submarginal line running almost to outer margin, with a yellow line above it and almost disconnected from the rest of the submarginal line which is yellow.

Habitat—Dharmsála; Pulo Laut; New Guinea. *Exp.* 14 mm.

4633*a.* NYMPHULA NIGRA, Warr., A. M. N. H. (6), xviii, p. 220.

Black-brown. Forewing with obscure medial grey band with waved edges, and an indistinct discocellular black lunule on its outer edge; a postmedial grey line excurved from costa to vein 2, where it is retracted to the medial band; slight grey streaks on the veins towards the margin. Hindwing fuscous.

Habitat.—Khásis. *Exp.* 18 mm.

P. 202. Under AMBIA, insert *Leucogephyra*, Warr., A. M. N. H. (6, xviii, p. 219 (1896).

4663*a.* AMBIA COMPLICATA, Warr., A. M. N. H. (6), xviii, p. 222.

♀. Head, thorax and abdomen fuscous mixed with white scales. Forewing with the basal and inner areas grey, almost entirely suffused with black, the costal area beyond the antemedial line fulvous, traces of a pale subbasal line; the antemedial line whitish defined by black and obtusely angled on median nervure; a black speck at middle of costa; a white discocellular lunule on a black patch; the postmedial line whitish defined by black, oblique from costa, then excurved to vein 3, and with a slight tooth inwards on vein 5, retracted along vein 2 to below angle of cell, then erect; a nearly straight submarginal ill-defined black and white line; a black and white mark at the excision below apex; a fine black marginal line with white line inside it. Hindwing almost entirely suffused with black; ill-defined black-edged ante- and postmedial lines almost meeting on inner margin, with a pale patch between them below lower angle of cell; slight submarginal white marks near apex and anal angle: the margin greyish with a fine black marginal line.

Habitat.—Khásis. *Exp.* 12 mm.

Leucogephyra.—Forewing of male with no glandular swelling on costa.

4666*a*. AMBIA SEMIFASCIALIS, Warr., A. M. N. H. (6), xviii, p. 219.

♂. Pure white; palpi and frons black; abdomen with a broad black band near extremity. Forewing with black speck at base of inner margin; an antemedial black line somewhat interrupted and slightly angled in cell; a speck at lower angle of cell; a postmedial line, in places represented by specks, excurved from costa to vein 2, along which it is retracted to below end of cell; a large black spot on middle of margin and cilia; some specks on the margin. Hindwing with traces of a subbasal line; medial and postmedial sinuous black lines, the spaces between them filled in with black from lower angle of cell to inner margin; some specks on the margin.

Habitat.—Khàsis. *Exp.* 16 mm.

4682*a*. OLIGOSTIGMA ARÆALE, Hmpsn., Trans. Ent. Soc., 1897, p. 170.

Male with the hind tibiæ and spurs tufted with long hair; short tufts at base of mid and hind femora. ♂. White; head, thorax and abdomen slightly tinged with fulvous and fuscous. Forewing with streaks of diffused fuscous scales below costa, from base of inner margin to cell and along vein 2, and from inner margin before middle along vein 1; slight yellow spots at base of vein 2 and on discocellulars, the latter with a dark speck above it on costa; an ill-defined yellow submarginal band with some dark scales on its edges; a marginal yellow band defined on inner side by a fine black line, and with a marginal series of minute black points. Hindwing with slight oblique fuscous line across end of cell; two diffused sinuous fuscous submarginal lines with some yellow between them at middle; a yellowish marginal band defined on inner side by a waved black line and with three marginal black spots with orange between them on the lobe.

Habitat.—Kandy, Ceylon ; *Exp.* 16 mm.

P. 216. Under PARTHENODES, insert *Gethosyne*, Warr., A. M. N. H. (6), xviii, p. 221 (1896).

4693*a*. PARTHENODES LATIFASIALIS, Warr., A.M.N.H.(6), xviii, p. 220. Head and thorax dark rufous suffused with black ; abdomen pale rufous. Forewing dark rufous, almost wholly suffused with black ; traces of a subbasal line ; an indistinct ochreous antemedial line slightly angled on median nervure ; a slightly darker discocellular patch ; an obscure postmedial line slightly sinuous below costa, then curved to vein 2, along which it is retracted to below angle of cell ; a series of dark specks just inside the margin ; cilia ochreous below apex and above outer angle. Hindwing fuscous, with obscure pale discocellular lunule and traces of postmedial line obliquely sinuous from costa to vein 2, along which it is retracted, traces of a series of dark specks inside the margin.

Habitat.—Khásis. *Exp.* 20 mm.

4695*a*. PARTHENODES ÆQUIVOCALIS, Warr., A. M. N. H. (6), xviii, p. 221.

♂. Black-brown, tinged in parts with rufous. Forewing with the costal area marked with rufous ; traces of an antemedial black line, an obscure rufous mark in end of cell, traces of a postmedial line, its costal portion defined by a wedge-shaped fulvous mark beyond it ; a fulvous spot on the margin below the apex, a smaller spot at middle and elongate spot above outer angle. Hindwing with obscure fulvous discocellular spot on inner margin above anal angle, and three marginal spots between middle and anal angle. ♀. Vertex of head and dorsum marked with orange. Forewing with the costal markings orange, some spots on basal area, and a prominent spot in end of cell ; the postmedial line prominent, sharply angled inwards at vein 5 and connected with the margin by black streaks at veins 6 and 4, the area beyond it pale golden-yellow with an oblique rufous line from costa to the streak at vein 4 ; cilia golden intersected by three black marks at middle. Hindwing with orange discocellular spot ; a series of orange specks inside the black postmedial line, which is sharply bent inwards at vein 5, then outwards again and irregularly dentate to inner margin ; the outer area golden-yellow with a rufous line parallel to the postmedial line ; a marginal black line ; the cilia golden intersected with black from middle to anal angle.

Habitat.—Khásis. *Exp.* ♂ 20, ♀ 24 mm.

P. 222. Genus MARGAROCHROMA.

Margarochroma, Warr., A. M. N. H (6), xviii, p. 164 (1896).

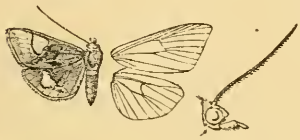
Type.—M. pictalis, Warr.

Range.—Assam.

Palpi porrect, extending about one-and-a-half times length of head, the 2nd joint fringed with hair below, the 3rd well developed, naked and bent downward; maxillary palpi filiform, frons with a conical prominence, antennæ of male ciliated ; tibiæ with the outer spurs about two-thirds length of inner. Forewing with veins 3, 4, 5 from angle of cell ; 7 shortly approximated to 8, 9, 10 near base. Hindwing with veins 3, 4, 5 from angle of cell, which is about half the length of wing ; 6, 7 from upper angle, 7 anastomosing with 8.

4702*a*. MARGAROCHROMA PICTALIS, Warr., A. M. N. H. (6), xviii, p. 165.

♂. Pale silky straw-colour ; palpi and sides of frons black ; abdomen with paired black basal spots, the anal tuft jet-black. Forewing with the basal area brownish towards the obliquely sinuous antemedial dark line, the area beyond it grey-brown in the form of a triangle with its apex on costa and extending to outer angle ; a dark-edged orbicular spot in cell and a black lunule on discocellulars ; a black spot on middle of inner margin ; a fine dark postmedial line curved from costa to vein 2, then strongly dentate, with traces of another line beyond it. Hindwing with the basal area suffused with grey, the disk with ferruginous, and with an orange spot beyond lower angle of cell ; traces of a sinuous submarginal line.



Margarochroma pictalis ♂ $\frac{1}{1}$

Habitat.—Khásis. *Exp.* 22 mm.

4719*a*. LUMA ORNATALIS, Leech, Entom., xxii, p. 71, pl. 4, f. 12.

♂. Pure white ; a black spot on anal tuft. Forewing with black spot at base of costa ; a straight slightly oblique antemedial black line ; a prominent discocellular spot, and spot below origin of vein 2 ; both wings with slightly curved postmedial line and fine submarginal and marginal lines. Hindwing with discocellular spot produced towards inner margin as a short line.

Habitat.—China, Khásis. *Exp.* 20 mm.

4721*a*. LUMA MONOMMA, Warr., A. M. N. H. (6), xviii, p. 173.

♂. Head and collar golden yellow; thorax and abdomen suffused above with fuscous-black, the latter with the extremity yellow. Forewing golden-yellow, the inner area from the base through the cell and thence to outer angle suffused with fuscous; a large round deep black discocellular spot; traces of ante- and postmedial waved lines on the fuscous area. Hindwing fuscous, with dark discocellular speck and sinuous postmedial line angled inwards below the cell; the outer area yellow.

Habitat.—Khásis. *Exp.* 20 mm.

4732*a*. DIATHRAUSTA PLUMBEALIS, Warr., A. M. N. H. (6), xviii, p. 174.

Head, thorax and abdomen pale fulvous tinged with fuscous; wing leaden-grey. Forewing with the costa ochreous; a straight dark antemedial line; the postmedial line with a large yellowish-white triangular patch from costa on its inner edge, sinuous and excurved from costa to vein 2, then retracted to below angle of cell. Hindwing with sinuous postmedial line retracted at vein 2 to below angle of cell; cilia of both wings ochreous.

Habitat.—Khásis. *Exp.* 24 mm.

4745*a*. PILETOCERA NUDICORNIS, Hmpsn., Trans. Ent. Soc., 1897, p. 214.

Antennæ of male normal and shorter than the forewing. ♂. Head, thorax and abdomen yellowish-white; palpi black, white below; wings silky yellowish-white, the outer half tinged with pale rufous on forewing with a fuscous tinge towards margin; obscure white discocellular spots; a dark postmedial line well-marked on forewing, arising from a black spot on costa, angled on vein 6, then oblique, on hindwing indistinct, angled on vein 6 and ending at anal angle; cilia dark at middle of forewing.

Habitat.—Khásis. *Exp.* 20 mm.

4751*a*. MABRA FAUCULALIS, Wlk., Cat. xix, p. 962.

Differs from *M. nigriscripta* in the forewing having two postmedial black annuli on costa, and a whitish apical patch; both wings with prominent submarginal series of black points.

Habitat.—Sikhim; Borneo. *Exp.* 16 mm.

4751*b*. MABRA FUSCIPENNALIS, Hmpsn., Trans. Ent. Soc., 1897, p. 221.

♀. Fuscous; vertex of head greyish; antennæ with black and white rings; wings irrorated with grey. Forewing with indistinct dark antemedial line and discocellular lunule; the dark postmedial line arising from a wedge-shaped white mark on costa, excurved to vein 2, then retracted to below angle of cell. Hindwing with indistinct discocellular speck and diffused oblique medial line; both wings with fine marginal dark line. Underside pale. Antennæ of male laminate.

Habitat.—Khàsis. *Exp.* 14 mm.

4751*c*. MABRA DAULIALIS, Warr., A. M. N. H. (6), xvii, p. 464.

♂. Orange-fulvous; abdomen with two black specks on anal segment. Forewing with diffused oblique rufous antemedial band; a dark speck in cell, a postmedial pale line incurved from costa to lower angle of cell, and with the dark discocellular lunule on its inner edge, strongly dentate inwards, and with a dark mark on the tooth below the cell; dark rufous streak on the veins beyond the cell, and a rufous patch on inner margin towards outer angle. Hindwing with rufous-edged postmedial line from costa to outer margin at vein 2, then retracted to below end of a cell, and terminating on inner margin above anal angle; two pairs of marginal black specks near anal angle.

Habitat.—Khásis. *Exp.* 14 mm.

4752*a*. MICRAGLOSSA ÆNEALIS, Hmpsn., Trans. Ent. Soc., 1897, p. 224.

Head, thorax and abdomen brassy-yellow, 3rd joint of palpi tinged with black, thorax spotted with black. Forewing brassy-yellow irrorated with black scales; an irregular black patch from near base of costa, an irregularly sinuous antemedial black band conjoined to a spot below the cell, the discocellular patch figure-of-eight-shaped, with broad black outline extending up to costa; traces of a postmedial line with an inward curve from costa to vein 2, then erect: large submarginal black patches on costa and inner margin and a smaller marginal patch below apex. Hindwing whitish suffused with fuscous towards margin.

Habitat.—Khásis. *Exp.* 16 mm.

4763*a*. ORTHORAPHIS METASTICTA, n. sp.

♂. Pale ochreous-brown; palpi blackish at sides. Forewing with series of pale semicircular marks with dark centres on medial part of costa; an ill-defined oblique dark antemedial band from cell to inner margin; a speck in cell and prominent discocellular spot; an interrupted postmedial black-edged white line, strongly incurved below vein 5 and bent outwards again to vein 1; a fine marginal black line; the base of cilia whitish. Hindwing whitish, a discocellular black speck, a short postmedial line between veins 5 and 2; the outer area fuscous, with a marginal black spot on vein 2; a deep black patch on anal lobe crossed by a white bar; cilia with a white line at base, at anal lobe white with black tips.

Habitat.—Khásis, Borneo. *Exp.* 18 mm. *Type.*—In coll. Rothschild.

4779*a*. PYONARMON RADIATA, Warr., A. M. N. H. (6), xviii., p. 169.

White with a slight ochreous tinge; patagia, metathorax and first segment of abdomen with paired black spots. Forewing with black speck at base and subbasal spot on inner margin; a fine straight antemedial line arising from a black spot on costa; a speck in cell and prominent discocellular spot; an oblique line from median nervure before end of cell to inner margin near outer angle; an oblique fine line from lower angle of cell to outer margin at vein 2; a curved band from costa beyond middle to outer margin at vein 3; a marginal series of black specks; the apex white. Hindwing with discocellular black speck; a fine sinuous postmedial line ending in a black spot on inner margin, the area beyond it more ochreous, a fine marginal line.

Habitat.—Khásis. *Exp.* 28 mm.

4787*a*. TABIDIA CANDIDALIS, Warr., A. M. N. H. (6) xviii, p. 169.

♀. White, head and thorax slightly tinged with brown; abdomen with some black on basal and anal segments, the three medial segments deep black above. Forewing with a subbasal fuscous shade; a fine antemedial line expanding into a black patch below costa; the inner medial area suffused with rufous; a black discocellular spot; a postmedial black patch on costa, with a line arising from it very sharply angled on vein 2; an apical fuscous spot. Hindwing with a postmedial black band, bent outwards and diffused almost to the margin at middle and terminating in a large black patch at anal angle; apex with some fuscous streaks.

Habitat.— Khásis. *Exp.* 16 mm.

4789*a*. EURRHYPARODES PLUMBEMARGINALIS, n. sp.

♂. Forewing of male with the glandular swelling on costa very large, oval, and extending nearly to apex; veins 8·9 bent downwards; 10·11 stalked: hindwing with the outer margin deeply excised below apex; fore tibiæ thickly fringed with hair. Head fuscous and ochreous; thorax and abdomen fuscous, the latter obscurely ochreous towards base. Forewing fuscous-brown with metallic reflections; an obscure yellow subbasal line and another yellow line on inner side of the sinuous black antemedial line which is angled at middle; a yellow mark on discocellulars, with a black spot on it; a large yellow patch below end of cell, bounded by the yellow postmedial line which is angled inwards below costa and sharply outwards on vein 3, then retracted to below end of cell; diffused leaden-grey on marginal area; cilia yellowish. Hindwing with the base dark, followed by a large very irregular yellow area with the black discocellular spot on it, and conjoined below the cell to the yellow postmedial line which is defined on inner side by a black line and bent outwards between veins 5 and 2, with a wedge-shaped dark patch in its sinus; diffused leaden-grey on marginal area; cilia yellowish.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In coll. Rothschild.

4804*a*. PAGYDA ARGYRITIS, n. sp. (pl. A, f. 26).

♂. Silvery white, sometimes tinged with pale yellow; abdomen barred with orange, a fine black line before anal segment. Forewing with orange spot on base of inner area; a curved orange antemedial line; a black speck at upper angle of cell and orange discocellular line; a postmedial orange line sending a tooth inwards above vein 5, at vein 2 retracted to below end of cell and expanding into a spot below vein 2; a highly dentate orange submarginal band and fine black marginal line. Hindwing with obliquely-curved medial orange line expanding into a spot below the cell; a postmedial orange patch between veins 6 and 2; a submarginal line commencing with a spot at vein 6 and ending with a spot at vein 2; a fine marginal black line.

Habitat.—Sikhim (Pilcher); Bhutan (Dudgeon). *Exp.* 22 mm. *Type.*—In British Museum.

4804*b*. PAGYDA AMPHISALIS, Wlk., Cat., xviii, p. 661.

Differs from *P. discolor* in being bright orange-yellow as in *P. botydalis*; the transverse lines rather broader.

Habitat.—Japan; China; Khásis. *Exp.* 24 mm.

4851*a*. NOSOPHORA DISPILALIS, Hmpsn., Moths. Ind., iv, p. 288.

Nosophora chironalis, Led., Wiener Ent. Mon., 1863, p. 407, pl. 14, f. 12 (*nec.* Wlk.).

Differs from *N. conjunctalis* in the hindwing of male having a tuft of hair in cell and a short ridge beyond the cell on underside ; the hind tibiæ, the inner terminal spur, and the whole tarsus fringed with hair. Much greyer brown without any ochreous tinge ; forewing with the spot pure silvery-white and deeply indented on upper part of outerside.

Habitat.—Khásis ; Borneo ; Pulo Laut ; Amboina. *Exp.* 30 mm.

4868*a*. TYSPANODES HYPSALIS, Warr., A. M. N. H. (6) vii, p. 426. (Pl. A, Fig. 9.)

Head, thorax, and abdomen yellow. Forewing grey ; the basal inner area yellowish ; two black spots below base of median nervure, and three on basal half of inner margin ; the veins from cell to outer margin and the interno-median interspace with prominent black streaks ; cilia fuscous. Hindwing fuscous ; the inner area yellowish ; a whitish streak from base below median nervure expanding into a large patch towards outer margin, but not reaching the margin.

Habitat.—China ; Sikhim. *Exp.* 36 mm.

P. 300. Genus PROCONICA, nov.

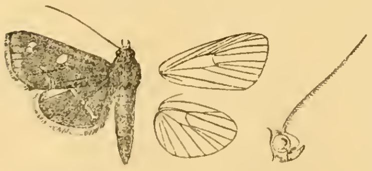
Type.—*P. nigrocyanalis*, Hmpsn.

Range.—Assam.

Palpi upturned, short, and not reaching vertex of head, the 2nd and 3rd joints conically scaled and tapering to apex ; maxillary palpi filiform ; frons with a large rounded prominence ; antennæ of male minutely ciliated and not as long as the forewing ; mid and hind tibiæ thickly scaled, the outer medial spurs about one-fourth length of inner. Forewing with veins 3, 4, 5 from angle of cell, 7 straight and well separated from 8, 9. Hindwing with the cell less than half the length of wing ; veins 3, 4, 5 from angle, 6, 7 from upper angle, 7 anastomosing with 8.

4874*a*. PROCONICA NIGROCYANALIS, n. sp.

♂. Black with a purplish tinge, palpi below, pectus, legs, and abdomen below, white. Forewing with very prominent quadrate white spot in cell ; three postmedial white striæ between vein 3 and inner margin, and two specks below costa towards apex ; cilia white above outer angle. Hindwing with straight medial white line interrupted at vein 5 ; cilia white above anal angle.



Proconica nigrocyanalis ♂ $\frac{1}{1}$.

Habitat.—Khásis. *Exp.* 30 mm. *Type.*—In coll. Rothschild.

4895*a*. DICHOCHROSIS DIMINUTIVA, Warr., A. M. N. H. (6) xviii, p. 168.

Orange; thorax with some black on vertex; abdomen with paired black spots on 1st segment, dorsal and paired lateral spots on four medial segments, the anal tuft black. Forewing with a reddish tinge; black subbasal spots on median nervure and inner margin; an antemedial oblique striga from costa, a spot in cell and discocellular spot; an irregular double series of spots from costa beyond middle curving round below the cell to middle of inner margin, some of the spots below the cell conjoined into streaks, two submarginal spots between veins 3 and 5. Hindwing with two conjoined spots at middle of inner area; an irregular medial series running towards anal angle with a curved series beyond it from costa to vein 5.

Habitat.—Khásis. *Exp.* 18 mm.

4896*a*. DICHOCHROCIS ACTINIALIS, n. sp.

♂. Bright yellow; thorax and patagia spotted with black; abdomen with a pair of black spots on basal segments, dorsal black bands on medial segments, and a black patch on anal segment. Forewing with four black spots on basal area; a straight erect antemedial black line; a spot in cell, a medial line slightly angled on median nervure; an oblique postmedial line from costa to vein 5; three submarginal streaks above vein 5, the middle one long, a line below them between veins 5 and 2, where it is retracted to the black spot at lower angle of cell, with three streaks beyond it between veins 5 and 2, and one below it above vein 1. Hindwing with slightly sinuous oblique medial line ending near anal angle and widening at middle; postmedial and submarginal broad lines coalescing at vein 2 and ending at anal angle.

Habitat.—Khásis. *Exp.* 22 mm. *Type.*—In coll. Rothschild.

4936*a*. NACOLEIA PEDICIALIS, Snell. Tijd. v. Ent., xxxviii, p. 49, pl. 6, f. 11.

Metasciodes apicalis, Warr. A. M. N. H. (6) xviii, p. 216.

♂. Brown; head, collar, and abdomen suffused with fuscous. Forewing long and narrow, the outer margin oblique, slightly irrorated with fuscous, the base suffused with fuscous; a sinuous dark antemedial line ; a line across the cell continued to vein 1 ; a black-edged reniform discocellular spot ; an indistinct fine bisinuate postmedial line arising from a speck on costa and ending in a spot near outer angle ; a subapical black patch just inside the margin extending down to vein 5 ; a series of specks just inside the margin. Hindwing with black-edged discoidal reniform spot with obscure sinuous line from it to a black spot on inner margin near anal angle ; a sinuous postmedial line ending at anal angle ; a series of specks just inside the margin.

Habitat.—Khásis ; Java. *Exp.* 22 mm.

4953*a*. BOTYODES CROCOPTERALIS, n. sp. (Pl. A, Fig. 17).

♀. Bright golden-yellow ; palpi black, white below ; throat pure white ; thorax and abdomen below black ; tarsi ringed with white ; a white spot on fore tibiæ. Forewing with black antemedial spot on median nervure ; a reniform discocellular spot ; a postmedial spot below vein 2 ; the whole apical area black with rounded inner edge. Hindwing with postmedial black spot above vein 5, with specks above and below it ; a spot below vein 2, with speck below it. Underside of forewing with the basal part of costal area suffused with black.

Habitat.—Sikhim (Pilcher). *Exp.* 40 mm. *Type.*—In coll. Rothschild.

P. 328. Under SYLEPTA insert *Haliotigris*, Warr., A. M. N. H. (6) xviii, p. 163 (1896).

4960*a*. SYLEPTA COMETA, Warr., A. M. N. H. (6) xviii, p. 163. (Pl. A, Fig. 15.)

♂. Head and thorax golden yellow, some black hair above the eyes, and a black patch on vertex of thorax ; abdomen white, the 1st segment black, a slight fuscous dorsal line. Forewing with the base golden-yellow ; sinuous black basal and antemedial lines, the medial costal area white ; fulvous orbicular and reniform stigmata slightly outlined with black and conjoined to the fulvous inner area which is irrorated with black, has a blackish spot and lunule on it, and becomes greyish at inner margin ; a prominent postmedial black band oblique from costa to vein 2, then retracted to below angle of cell ; the outer area whitish, the veins streaked with black, and a large slate-grey patch occupying the apical half of margin. Hindwing white with diffused black subbasal band ; a blackish discocellular patch emitting a streak to the margin on vein 2 and short streak on vein 3; the veins of outer area slightly streaked with fuscous, and slight fuscous suffusion on apical and anal areas. Underside with the orbicular and reniform stigmata black.

Habitat.—Khásis. *Exp.* 46 mm.

4969*a*. SYLEPTA NIGRISCRIPTALIS, Warr., A. M. N. H. (6) xviii, p. 100.

Notarcha paucinotalis, Warr., A. M. N. H. (6) xviii, p. 166.

♂. Brown with a slight fuscous tinge. Forewing with black speck below middle of cell with traces of a line between it and inner margin; a black speck in end of cell and discocellular lunule; the postmedial line minutely dentate, indistinct, excurved between veins 5 and 2 then retracted, and with two black marks on it above inner margin; a marginal series of black specks. Hindwing more suffused with fuscous the postmedial line obscurely dentate, obliquely sinuous from costa to vein 2, then retracted and obsolescent.

Habitat.—Khásis; Queensland. *Exp.* 34 mm.

5090. ARCHERNIS FULVALIS, n. sp.

Antennæ of male serrate for a short distance, a tuft of scales on inner side at one-third from base. Orange-fulvous; palpi white below. Forewing with the costa tinged with fuscous; a fuscous antemedial line angled outwards below cell and inwards on vein 1; a discocellular spot; a minutely dentate postmedial line, angled inwards above vein 5, recurved on vein 2 to below end of cell, then excurved again. Hindwing with discocellular speck; a postmedial line highly excurved between veins 5 and 2; both wings with some fuscous on margin, the cilia black at base, white at tips.

Habitat.—Sikhim, 1,800′ (Dudgeon); Hambantota, Ceylon (Pole). *Exp.* 24 mm. *Type.*—In British Museum.

5091*a*. ARCHERNIS LUGENS, Warr., A. M. N. H. (6) xviii, p. 110.

Dark fuscous; palpi white below at base; legs and underside of thorax and abdomen white. Forewing with traces of erect dark antemedial line; a discocellular spot; an obscure diffused postmedial line bent outwards and minutely waved between veins 5 and 2, then retracted to below angle of cell; cilia white at outer angle. Hindwing with traces of postmedial line excurved between veins 5 and 2; cilia white in places towards anal angle, underside whitish.

Habitat.—Khásis. *Exp.* ♂ 20, ♂ 26 mm.

5112*a*. CROCIDOPHORA AURIMARGO, Warr., A. M. N. H. (6) xviii, p. 109.

♂. Differs from *C. limbata* in the head, thorax and abdomen being fulvous. Forewing lighter brown; the costa orange throughout; the outer margin yellow, narrowing to apex and outer angle. Hindwing semihyaline yellow, with a fuscous brown patch just inside medial part of outer margin.

Habitat.—Khásis. *Exp*. 28 mm.

5146*a*. Sect. III. Antennæ of male ciliated; tibiæ fringed with long hair.

PACHYNOA SPISSALIS, Guen., Delt. and Pyr., p. 327.

White, suffused with pale red-brown; collar fringed with pure white. Forewing with pure white at base of inner margin; a white discocellular spot; an indistinct curved and minutely crenulate submarginal line, with rather darker brown suffusion beyond it; some diffused white below apex. Hindwing whiter, with the brown suffusion chiefly on inner and marginal areas; a minutely crenulate line from costa beyond middle to vein 2 near outer margin.

Habitat.—Khásis; Java. *Exp*. 42 mm.

5148*a*. DISCOTHYRIS MEGALOPHALIS, n. sp.

♂. Dull ferruginous-brown; palpi white below at base. Forewing with discocellular black lunule; a postmedial series of black specks, most prominent towards costa and forming a larger spot on costa, excurved from below costa to vein 4, then inwardly oblique. Hindwing with the tuft very large, extending along vein 2. and blackish; a postmedial sinuous black line somewhat maculate between veins 5 and 2; both wings with black line at base of cilia.

Habitat.—Khásis. *Exp*. 18 mm. *Type*.—In coll. Rothschild.

5150*a*. PACHYZANCLA COPTOBASALIS, n. sp. (Pl. A, Fig. 25.)

♂. Antennæ with a curved tuft of hair on basal joint, the base of shaft excised. Deep fuscous; palpi brown, white below; frons whitish; underside of thorax and abdomen white, the latter ringed with white above. Forewing rather narrow; a very indistinct antemedial line; traces of a discocellular point; both wings with an indistinct postmedial line excurved from costa to vein 5, then retracted to below angle of cell; a very fine pale marginal line.

Habitat.—Bhutan, 2,500′ (Dudgeon). *Exp.* 24 mm. *Type.*—In British Museum.

5159*a*. PACHYZANCLA LATIFUSCALIS, n. sp.

♂. Ochreous; head and thorax suffused with fuscous; abdomen with two pairs of black dorsal points on 2nd and 3rd segments, the distal half fuscous; anal tuft whitish. Forewing with the base suffused with fuscous; the costa suffused with fuscous to beyond middle, expanding beyond the cell; a sinuous black antemedial line; a black point in cell and discocellular lunule; a sinuous postmedial line, expanding into a spot on costa, excurved and minutely dentate between veins 5 and 2, then retracted to below angle of cell and excurved again; outer area broadly fuscous. Hindwing with discocellular spot; a postmedial line excurved and minutely dentate between veins 5 and 2; outer area broadly fuscous.

Habitat.—Bhutan 2,500′. (Dudgeon). *Exp.* 22 mm. *Type.*—In British Museum.

P. 407. Under PHLYCTÆNODES insert *Plateopsis*, Warr., A. M N. H. (6) xviii, p. 170 (1896).

5164*a*. PHLYCTÆNODES VESPERTILIO, Warr., A. M. N. H. (6) xviii, p. 171.

♂. Dark fuscous; palpi white below at base; legs and underside of thorax and abdomen white. Forewing with erect somewhat diffused antemedial dark line; a prominent discocellular spot; the postmedial line minutely waved, bent outside between veins 5 and 3, then retracted to below angle of cell; a dark marginal line; cilia white at outer angle. Hindwing with indistinct postmedial line bent outwards between veins 5 and 2, then retracted to below angle of cell; a dark marginal line; cilia white in places towards anal angle. Underside whitish.

Habitat.—Khásis. *Exp.* 18 mm.

5165*a*. PHLYCTÆNODES DECOLORALIS, Warr., A. M. N. H. (6) xviii, p. 111.

♀. Head, thorax, and abdomen rufous, suffused with fuscous. Forewing rufous, suffused to middle with fuscous; traces of an oblique sinuous antemedial line; an obscure speck in cell and discocellular lunule ; both wings with a diffused dark spot at lower angle of cell ; a minutely dentate postmedial line excurved between veins 6 and 2, then retracted to lower angle of cell and erect to inner margin ; a fine marginal line ; the cilia dark. Underside pale, with some fuscous suffusion in cell of forewing.

Habitat.—Khásis. *Exp.* 26 mm.

P. 429. Under Pyrausta insert *Ebuleodes*, Warr., A. M. N. H. (6) xviii, p. 112 (1896).

5234*a*. Pyrausta triplagalis, Warr., A. M. N. H. (6) xviii, p. 114.

♀. Fuscous suffused with leaden-grey ; palpi black, white below at base ; legs and outside of thorax and abdomen white, the end of fore tibiæ banded with black. Forewing with the costa tinged with fulvous; a bright yellow quadrate spot at middle of cell, and large discocellular reniform spot extending down to vein 3, both conjoined to the fulvous costal area. Hindwing with large yellow discocellular lunulate spot, the lower part of its outer edge dentate.

Habitat.—Khásis. *Exp.* 24 mm.

5236*a* Pyrausta fuscalis, Warr., A. M. N. H. (6) xviii, p. 217.

♀. Dark brown. Forewing with faint traces of annuli at middle of cell and on discocellulars, with lines from them meeting on inner margin; faint traces of a postmedial line excurved below costa. Hindwing rather paler, greyish below. Underside of thorax and abdomen whitish.

Habitat.—Bombay. *Exp.* 20 mm.

5252*a*. Pyrausta simplex, Warr., A. M. N. H. (6) xviii, p. 112.

♂. Ochreous ; palpi white below at base. Forewing with traces of obliquely curved antemedial line, of a speck in cell, and line on discocellulars ; some very slight dark suffusion beyond lower angle of cell ; a rather more prominent postmedial line curved from costa to vein 3, then inwardly oblique. Hindwing with very slight dark suffusion at end of cell ; and indistinct curved postmedial line.

Habitat.—Khásis. *Exp.* 26 mm.

Explanation of Plate A.

1. Rhodoneura dohertyi.
2. Selea plagiola.
3. Rivula barbipennis.
4. Eutelia harmonica.
5. Falcimala sagittifera.
6. Chloroclystis griseorufa.
7. Macalla hypoxantha.
8. Mixophyla xanthocasis.
9. Tyspanodes hypsalis.
10. Parasa pæera.
11. Thalassodes anomala.
12. Chærocampa grisio-marginata
13. Rhodoneura mollis.
14. Urapteryx convergens.
15. Sylepta comalis.
16. Chlorodontopera marmorata.
17. Botyodes crocopteralis.
18. Larentia canaliculata.
19. Sadarsa arcuata.
20. Gyrtona camptobasis.
21. Lethes pectinifer.
22. Leucania laniata.
23. Capnodes lacteicosta.
24. Gathynia pernigrata.
25. Pachyzancla coptobasalis.
26. Pagyda argyritis.
27. Macalla hypnonalis.

(*To be continued.*)

SOME KONKAN BATS.

By R. C. Wroughton, C.M.Z.S.,
Indian Forest Service.

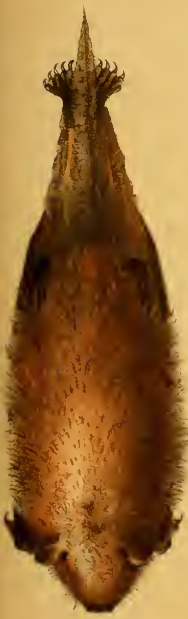
[WITH A PLATE.]

(*Read before the Bombay Natural History Society on 18th Sept.*, 1899.)

This paper does not profess to be an exhaustive list of the bats of even the limited area with which it deals. In the present state of our knowledge of systematic zoology in India, there can be no doubt that authentic lists of any group, in any definite area, are of the greatest value. The incompleteness of a list, though it undoubtedly reduces its value, is very far from making it useless, so long as that incompleteness is recognized. As I do not expect to have further opportunities of collecting in the area with which this paper deals, I offer this record of the species I have been able to obtain in it, in the hope that members, who have the chance, will either add to it or help towards its completion by sending in specimens. Properly "made" skins, with their skulls, are the best form in which to send in specimens, and any one willing to help in this way—whether in this or any other definite area—can always obtain printed instructions for guidance on application to the Honorary Secretary of this Society. There are many, however, who have no taste or no leisure for such work, who yet can help by putting any bats they may be able to obtain into spirits and sending them to the Society.

I wish to record here my grateful thanks to Mr. Oldfield Thomas, of the British Museum, for his kind help and encouragement, without which I should never have plucked up courage to make this, my maiden excursion into systematic zoology, and also my thanks to Mr. F. O. Pickard Cambridge, for the excellent plate which he has drawn for this paper.

In the hot weather of 1897 I made a small collection of bats in the Surat District north of the River Tapti. These were sent by the Society to the British Museum, where they were studied by Mr. Oldfield Thomas, who published the result of his examination in our Journal (Vol. XI, pt. 2). I continued collecting during the remainder of 1897 and up to April 1898, in the North Konkan and in South Guzerat, *i.e.*, in the Thana and Surat Districts, which embrace roughly the strip of country lying between the Ghâts and the Sea, from Bombay



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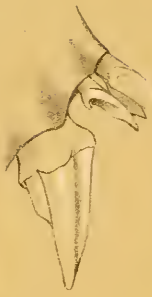

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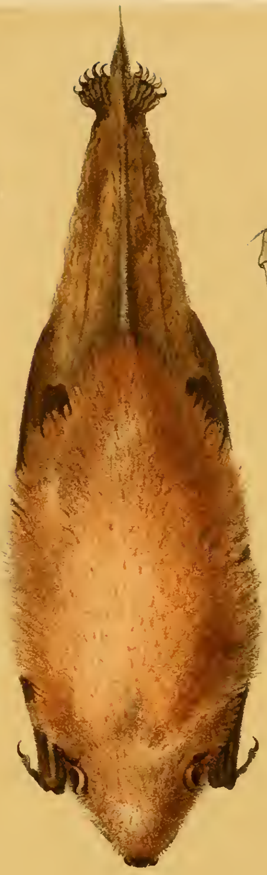

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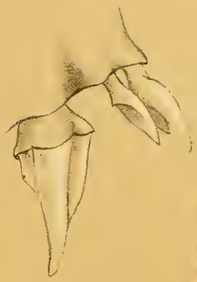

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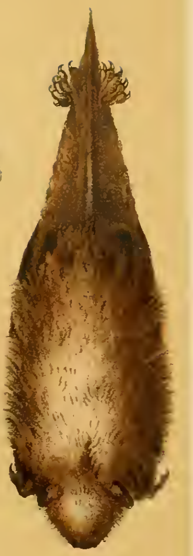

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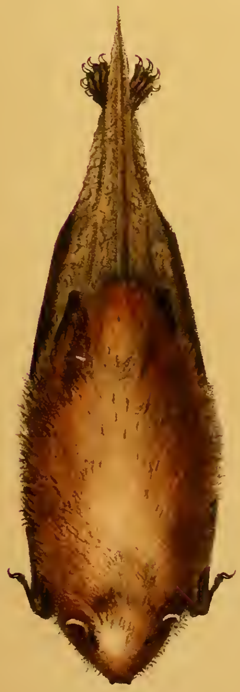

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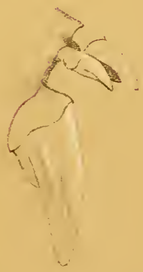

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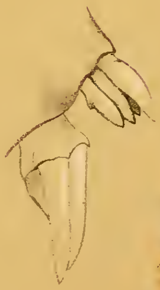

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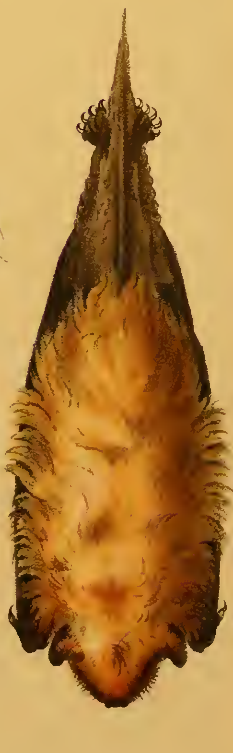

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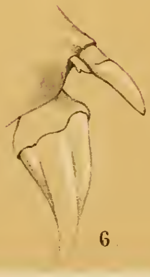

6

Fred^k O Pickard Cambridge, pinx, lith.

Mintern Bros. Chromo London.

northward to the Tapti River (and including a narrow belt of jungle country, from 10 to 20 miles wide, on the north bank of that river). A few specimens were also contributed by Mr. J. Dodgson, Indian Forest Service, collected by him in the Thana District.

I have adopted the classification followed in Blanford's Mammalia subject to certain alterations in nomenclature, rendered necessary by more recent publications, which I shall indicate in due course. I give all measurements in millimetres, including those given by Blanford in inches. One inch is very approximately equal to 25 millimetres. The numbers in brackets refer to Blanford's "Mammalia."

The sub-order MEGACHIROPTERA, which comprises the fruit-eating bats, contains the single family PTEROPODIDÆ which is represented in our area by two genera, *viz* :—

PTEROPUS.

The flying-fox, partly because it was so common, and partly because I could not spare leisure to prepare such large specimens, is not represented in my collection. Our local species is no doubt *Pteropus medius*, Temminck (No. 134 in the Mammalia); but, in view of the number of synonyms recorded by Blanford, it would not be safe to say that the species will not again have to be split up when series of specimens from various localities are available for study. Such series, especially if they also represent the seasonal changes (if any), are a great desideratum.

CYNOPTERUS.

I have only collected *C. marginatus*, Geoff. (No. 138) at Bandra, but have seen it at various places throughout our area. It is quite common and of considerable size, but it flies very low and swiftly, dodging about amongst bushes and low trees in search of fruit, and hence escapes notice unless looked for. Any one who chooses to watch a plantain tree in flower, about half an hour after sunset, is pretty certain to get a chance of making its acquaintance. I have found it feeding on wild figs, but it seems to be especially fond of plantain flowers, and must do much damage in the gardens along the coast.

The white margin to the ears, noted by Blanford, is most characteristic; the only specimen in the British Museum in which it is missing is an immature female sent by Mr. Dodgson from Bandra.

Of the second sub-order, *i.e.*, the MICROCHIROPTERA, or insect-eaters, the first family (RHINOLOPHIDÆ) is, so far as I know, not represented in our area, and the second, NYCTERIDÆ, is so by one species only, *viz*:—

MEGADERMA.

Megaderma lyra, Geoff. (No. 169).

The Indian Vampire is a very common and widely distributed bat throughout the Konkan. I took specimens at Kim and at Bandra, the two extreme north and south points of our area, but have found it everywhere. It flies very low and swiftly, skimming over the open ground in search of food, and so does not attract notice on the wing. Almost every old dry well and cave, however, will be found to harbour a roosting colony of this bat. In Bandra, where probably no such places were available, I got it roosting in the gable roof of a bungalow.

The next family, VESPERTILIONIDÆ, contains the bulk of our bats, and it is here that correction is required in the nomenclature of Blanford's Manual. As already partly pointed out by Mr. Thomas in his paper in our Journal, *Vesperugo* as a genus (p. 296) disappears, and its sub-genera (p. 302) are raised to generic value, their names however being changed as follows :—*Vespertilio*, *Pipistrellus* and *Hesperoptenus* are substituted respectively for *Vesperus*, *Vesperugo* and *Hesperoptenus* as given by Blandford. Further (p. 296) *Scotophilus* must be used for *Nycticejus*. Finally *Vespertilio* having been taken for *Vesperus* must be replaced (p. 296) by *Myotis*. This last change, however, does not affect this paper, for no representative of the genus *Myotis* occurs in our area. The same is true of *Vespertilio* (late *Vesperus*) ; on the other hand *Pipistrellus* (late *Vesperugo*) is the best represented genus we have, there being three known species, all of which are common, if local, and to these I am adding two new ones.

PIPISTRELLUS.

Pipistrellus dormeri, Dobs. (No. 193).

Blanford knew of only three specimens of this bat, and when Mr. Thomas found another in my first collection, he had still to write of it, as "this rare bat." In 1898 I found it quite common in the Mandvi Taluka of Surat, where I collected 16 specimens (*viz.*, 11 males and 5 females). Later I got a male at Bulsar and Mr. Dodgson shot another at Pareli, on the hills north of the Tansa Lake, in the Thana District. This seems to show that it is distributed through the two Districts, though it is undoubtedly more common along the north bank of the Tapti River.

My measurements taken from fresh specimens run rather larger than those given by Blanford. They compare as follows :—

	Head and Body.	Tail.	Forearm.
Blanford's	44	31	35
Average of 11 males ...	51·5	39	35
Average of 5 females ...	51·8	38·8	35·2

The minute outer incisor (see Plate, fig. 6) distinguishes it at once from all our other *Pipistrelles*. In fresh specimens this is so buried in the gum that it is easily overlooked, and *P. dormeri* then seems to have only one incisor on each side. The ashy tips of the hairs give this bat, especially when freshly killed, a silvery lustre. This silvery look, which is especially noticeable on the breast and belly, is also very characteristic.

P. dormeri is not a bat of the cities. It seems to prefer a large solitary tree, standing in cultivation as a roosting place. Only a small number share a tree, round which they hawk, rarely leaving its immediate neighbourhood. They are on the wing shortly after sunset.

Pipistrellus ceylonicus, Kelaart (No. 186).

The type specimen of this bat is lost, but I think Blanford was amply justified in identifying it with *P. indicus*, Dobson. At the same time I think he is wrong in taking his measurements from the Wynaad specimen, which is too bleached to give any reliable indication of its real colour, and at the same time, too damaged for identification by its dentition. Blanford's measurements compare with mine as follows (I add Dobson's measurements of *P. indicus*) :—

	Head and Body.	Tail.	Forearm.
Blanford	50	40	41·3
Average of 4 males ...	50	37	37·5
Average of 11 females.	51·5	39·5	37·5
Dobson's *P. indicus* ...	52·5	42·5	37·5

The measurement of the forearm, being that of a bone, is the most important, for there can be only one way of measuring it. I may add that the British Museum has specimens from Ceylon (in spirits), which are undoubtedly the same species as mine, and which give the same forearm measurement.

Though after examining a series of each of our three common *Pipistrelles* it is not difficult to distinguish *P. ceylonicus* by its colour, yet it is difficult to put the difference into words. I can only say that the pale tips of the hairs give the impression of a very dark brown—almost black—bat, with a reddish or brown 'bloom' in certain lights (Plate, fig. 4). The dentition (Plate, fig. 4*a*), however, is markedly different from that of *P. abramus.*

This bat is essentially a town-dweller. I shot two at Bulsar, but all the rest I got at Bandra, and most of them were brought to me by native boys, who took them roosting in the tiles of houses in the bazaar. One was shot by Mr. Dodgson in Bassein. This may point to its being a seaside bat, but it may more probably be due to the fact that large villages with tiled roofs are mostly found along the coast.

From a pregnant female shot at Bandra on the 7th September I took two fully formed young ones ; while on the 10th October, two immature specimens, fully two-thirds the size of adults, were brought to me.

Pipistrellus chrysothrix, n. sp.

The specimen being a dried skin, the ears have shrunk and become distorted, so that detailed characterization of their shape is impossible, but generally they are of the same type as in *P. ceylonicus.* Fur long and loose of a golden brown (Plate, fig. 5). Were it not for the lustreless appearance, caused by the long loose fur, the colour might well be described as 'old gold.' The under parts are paler, *i. e.*, more golden, than the upper. At first sight, it appears that the individual hairs are the same colour from base to tip, but this is disproved by the fact that, when the fur is smoothed down, narrow transverse dark bands—faint, it is true, but quite distinct—can, in certain lights, be seen crossing the back, especially towards the tail. Tail and membranes black.

The dentition (Plate, fig. 5*a*) is most characteristic. The secondary cusp of the upper, inner incisor is posterior to the main cusp, so that, though well developed, only its extreme tip can be seen between the two incisors. The outer incisor has two sub-equal cusps, only slightly shorter than the main cusp of the inner, and almost in the same plane with it (the inner cusp is very slightly behind the outer), so that, at first sight, this species seems to have *three* upper incisors on each side.

The dimensions are : Head and body 56 ; tail 42 ; forearm 38. Thus showing it to be markedly larger than *P. ceylonicus.*

A single specimen of this bat was shot by Mr. Fry, Indian Forest Service, at Mheskatri, in the extreme north-west corner of the Dangs, and is now in the British Museum, as the type of this species.

On almost the same day and at the same place I shot a female bat which I thought was *P. ceylonicus.* Its dimensions are—head and body 54, tail 39, forearm 39. It was a curious place in which to find *P. ceylonicus*, for there was not a tiled roof within many miles, except that of the Forest Rest House, from which this specimen had certainly not come. Unfortunately it is a very aged specimen, so much so that the incisors are worn right down to the jaw, and thus afford no indication for its identification which consequently must wait until more specimens of *P. chrysothrix* are available for comparison.

On the whole the species is nearest to *P. ceylonicus*, from which, however, it is easy to distinguish it by the length and colour of the fur, and by the peculiar shape of the outer incisor of the upper jaw.

Pipistrellus abramus, Tem. (No. 187).

The specimens which I identify as *P. abramus* (Plate, figs. 2, 2*a*) correspond very fairly with Blanford's description except in the measurements, which compare as follows :—

	Head and Body.	Tail.	Forearm.
Blanford	45	35	33
Average of 9 males...	44	33	29
Average of 5 females	46	34	30

The discrepancy in the length of the forearm will be noted, and it is all the more curious because, in my series of 15 specimens, in only one very large one is 31 recorded for the forearm ; all the rest are between 28 and 30. There are two other specimens (a pair), however, which show 33, but, though somewhat resembling *P. abramus* in general facies, their dimensions, other than that of the forearm, are so abnormally small (head and body 39, tail 34·5), that I have excluded them from my identification, and left them for further study, when more specimens shall be available for comparison; the list of synonyms recorded for *P. abramus* is too long to lightly risk providing another. Either *P. abramus* is a species varying considerably in different localities, or several species, having a certain amount of resemblance to one another, have been lumped together, and these are questions which can only be settled by the comparison of series of specimens from many different localities.

P. abramus, as defined by Blanford, is admittedly the commonest, and most generally distributed, of all the *Pipistrelles*; and the series of specimens (which I identify as *P. abramus*) represents a species, which is undoubtedly the commonest of the *Pipistrelles* throughout the two districts embraced by this paper. I have taken it wherever I have collected throughout our area.

I believe that Blanford is mistaken in styling it " especially a house-bat." In my experience that title undoubtedly belongs to *P. ceylonicus*. While frequenting the neighbourhood of human habitations, as well as jungles, *P. abramus* roosts almost invariably in trees, if they are available. The native boys, who constantly searched the roofs of their houses at Bandra, and brought me the bats they found roosting there, invariably brought me *P. ceylonicus*, and never *P. abramus*, and yet I shot many more of the latter than of the former in the immediate neighbourhood of these same houses.

Pipistrellus mimus, n. sp.

Among the specimens of *P. abramus* collected by me, Mr. Thomas called my attention to a certain number of evidently adult but very small individuals.

In general shape these specimens are exactly like *P. abramus*, and after careful examination I have been unable to find a single characteristic difference between them except size.

From series of the two species individuals can be picked out which closely resemble each other in coloration, but in *P. abramus* there is always a suggestion of red or brown, which is absent in *P. mimus*, the colour of which is consequently colder, the bases of the hairs in *P. mimus* are black, while the tips are slate-coloured—darker or lighter in different individuals. The fur in *P. mimus* is also somewhat longer and looser, *i. e.*, less sleek, than in *P. abramus*. (Plate, fig. 3.)

The dentition is of the same type as in *P. abramus*. In the latter the inner and outer incisor do not touch and are stouter, while in *P. mimus* they are close together, and more linear; but the difference is small. (Plate, fig. 3*a*.)

As already said, *P. mimus* is markedly smaller than *P. abramus.* The dimensions of 7 specimens, unfortunately all males, collected by me are as follows :—

Head and Body.	Tail.	Forearm.
35	31	27
39	35	28
38	33	27
40	32	28
40	30	28
41	30	28
36	33	27

Of seven skulls of *P. abramus* (male), six are 12·5 in greatest length (the 7th is 12·3) ; while in greatest breadth, four are 7·5 and three are 7·3. The corresponding measurements for *P. mimus* give 11·5 as greatest length in all cases ; while the greatest breadth is, 7 in three cases and 6·5 in two others (two skulls are missing).

The first two specimens in the above table were obtained in the Mandvi Taluka of Surat (north of the Tapti River), while the rest were taken at various places (Mheskatri, Jhaura, &c.) in the north-west corner of the Dangs.

As far as can be judged from so small a collection, *P. mimus* is a bat of the heavy jungles. It resembles *P. abramus* in its habits, as it does in shape, but it does not 'represent' it, to the exclusion of the latter, for I have shot both at the same place on the same evening.

The genus Hesperoptenus is represented in our area by one of its two species only.

Hesperoptenus tickelli, Blyth (No. 191).

This appears to be a comparatively rare bat. I obtained only two specimens, both males, one in the centre of the Surat and the other of the Thana District.

Either this is a bat which varies immensely in size or the measurements quoted by Blanford are those of an immature specimen.

	Head and Body.	Tail.	Forearm.
Blanford...	65	50	52·5
Thana specimen... ...	71	56	58
Surat specimen	61	49	50

The last of these is certainly immature.

Hesperoptenus appears on the wing much later than the *Pipistrelles.* Both specimens I got when it was almost dark. Perhaps this and not its rareness is answerable for the few specimens I obtained.

Finally the genus SCOTOPHILUS (late VESPERUGO) of this family is represented in our area by two species.

Scotophilus kuhlii, Leach (No. 94).

Blanford mentions a form (*S. heathi*, Horsf.) ranked by Dobson as a variety, the forearm of which varies between 60 and 67. It is probably to this variety or species that our local form belongs. The average length of forearm in eight specimens (5 male and 3 female) collected by me is 59 (varying between 57 and 61).

This is a common bat with us, and is well distributed. I have taken it in all parts of the Surat and Thana Districts. The bright canary yellow belly is a very noticeable feature in *S. kuhlii.*

Blanford speaks of *S. kuhlii* as "the first to appear in the evening," but in my experience it never appears until the *Pipistrelles* have been some time on the wing. I have never seen it 'hawking' like these latter, but always starting off steadily, apparently making in a bee line for some distant but definite point.

Scotophilus wroughtoni, Thomas.

This species (Plate, fig. 1) was described by Mr. Thomas in his paper in our Journal (to which I have referred above) on a single female specimen which I obtained at Mandvi (Surat District). He quotes the tail dimension as 40; this is an error for 49 or 50. The mistake was made by myself in writing out the ticket of what is now the type specimen. I have since obtained another female at Bulsar, of much the same size, whose tail is recorded as 51. I have also taken a series of 10 males, whose average tail measurement is 49·5 (varying between 46 and 54). The male forearm seems to run a little shorter than the female; the average of 10 specimens being 47·5 (varying only between 47 and 49).

Except by its size it cannot be distinguished from *S. kuhlii* on the wing; wherever I have found it, it has been associated with that species. Like *S. kuhlii*, it almost certainly roosts in crevices in masonry; it also appear about the same time in the evening and flies in the same way. On one occasion only I found it 'hawking' about some large trees, on the outskirts of a village.

Bulsar is the most southerly point at which I have taken *S. wroughtoni*, but I expect it will be found to occur in Thana, especially in the neighbourhood of some of the old forts, in which roosting places, such as it frequents, abound.

The last family of the bats, the EMBALLONURIDÆ, is represented with us by one genus and species only.

Taphozous.

Taphozous longimanus, Hardwicke (No. 220).

This species is most easily recognised by its gular sack and its long free tail. It is a species which apparently varies very little, for my specimens differ in no appreciable way from Blanford's description.

It is very common and generally distributed, and I have met with in everywhere in our area, but have never succeeded in finding a roosting place. It is a strong flier, but moves steadily when hawking its food and does not jerk about as do the *Pipistrelles*. It generally appeared just before dark.

Description of Plate.

Note.—*The illustrations of the dentition represent in each case the canine and incisors of the upper jaw (right side).*

1. *Scotophilus wroughtoni*, Thomas, p. 724.
2. *Pipistrellus abramus*, Temminck, p. 721.
2*a*. *Do. do.* (dentition).
3. *Pipistrellus mimus*, n. sp., p. 722.
3*a*. *Do. do.* (dentition).
4. *Pipistrellus ceylonicus*, Kelaart, p. 719.
4*a*. *Do. do.* (dentition.)
5. *Pipistrellus chrysothrix*, n. sp., p. 720.
5*a*. *Do. do.* (dentition.)
6. *Pipistrellus dormeri*, Dobson (dentition), p. 718.

FISHING IN INDIAN WATERS.

PART IV.

THE ANDAMAN ISLANDS.

BY F. O. GADSDEN, R. I. M.

(*Read before the Bombay Natural History Society on 18th Sept.*, 1899).

"'Tis a far cry to Lock Awe," is a well-known Highland proverb, and a far cry it no doubt is, from Aden to Port Blair, from the spot which I last introduced to the members of this Society, to that to which I would now draw their attention. The one is also a complete contrast to the other. While the ragged and barren outlines of the Aden rocks at first sight tend to repel, the first view that one gets of the Andamans, coming in from the sea, is almost fairy-like in its fascination. A group of islands wooded down to its water's edge (except when the settlement clearances have been effected) with a luxuriant growth of tropical foliage, and set in a sea of brilliant cærulean hue, they are indeed a picture of surpassing loveliness, and besides that they give one the impression of perfect peace and calm. Not that the sea here is always calm; far from it, for these islands are the cradle of those terrific cyclones, which often form and sweep with irresistible violence up the Bay of Bengal, and breaking upon different parts of the Indian and Burman coasts, cause infinite devastation to the districts over which they sweep. Curiously the islands do not always escape. In November, 1891, a terrible cyclone swept over them, and the effects were such, that many of the hill sides were swept bare of trees and vegetation, and twenty years will certainly not suffice to repair the damage done in less than half as many hours.

Lying as they do in the fair-way of the traffic up the Bay of Bengal, they have of course been known for many centuries, and at one time were, together with the lesser group, the Nicobars, in the possession of the Danes, who established certain Missionary settlements in them, but of these settlements there are no traces, unless it be in the curious blue eyes and fair hair which are occasionally seen in individuals of the Joruas, a negroid tribe who run wild in the Nicobars, and also in the strain of wild cattle which are to be found there. Malays and Chinese have traded with these islands from time immemorial, but the islands were never seriously taken in hand until somewhere in the early fifties, when they were chosen by the Indian Government as a fit and proper place in which to establish their penal settlement. They are administered by a Chief Commissioner and a staff of settlement officers, and rule and order is maintained by a body of about 800 Sikh Police, a small number of European troops (two companies generally from the Regiment stationed at Rangoon are detailed for this duty), and half a native regiment of Madras Infantry. The criminal population is about 15,000. Many of these latter, the better behaved ones, are allowed to marry and have plots of ground allotted to them, and settle down on these clearances and cultivate the soil ; but by far the larger number are kept in durance vile, all their lives in immense prison buildings erected in different parts, and their labour is utilized for the benefit of Government.

The aborigines are unique. A negroid race utterly unlike the inhabitants of the neighbouring countries, their very existence is an ethnological puzzle. Where they came from, and who and what they are, is a problem which has not yet been satisfactorily solved. An adult male Andamanese stands from 4′-3″ to 4′-7″ high and a female from 4′-0″ to 4′-3″. Though so small, they are perfectly formed miniature men and women. The men are pleasant to look upon, and very strong and muscular, but the women as a rule are singularly ill-favoured. They live in small communities in the jungles, exist almost entirely by the chase, and as hunters are extremely expert with their primitive weapons ; while their dexterity with the bow and arrow both on land and on the water, where they hunt, shoot, and spear the fish, is simply incredible. Like most aboriginal savage races, since coming in contact with a higher civilization, they have deteriorated physically, and are rapidly dying out, and before very many years will probably have disappeared leaving behind them absolutely no trace of their existence. There is one officer of the settlement who has been placed specially in charge of them, and he is devoting his whole life and energies to the task of recording their history, and in future days his voluminous notes, his most excellent collection of photographs, and his wonderful museum of their instruments, both of war and of peace of all sorts, will be all that future students will have to enable them to form an idea of what this most interesting and curious race was like. The headquarters of the settlement are on Ross Island, better known perhaps as Port Blair, and there are also considerable settlements at Aberdeen and Viper Islands, and also at Port Mowatt and Hope Town. This latter place was the scene of the assassination of the then Viceroy of India, Lord Mayo, who met his death at the hands of a fanatic Mussulman convict in 1872. There is a small pier or landing stage here, and it is the landing place for and on the way to Mount Harriet, the Government Sanatorium. It was here on returning from a visit to Mount Harriet, that the tragedy took place. As a fishing resort it is, however, that I would draw your attention to it, and from this point of view it is unsurpassed. As in the case of Bombay and Aden, in each of which places, as I have before noted, one fish is found to engross the Angler's attention, so here is it much the same. However good the general fishing may be, and very often is, either with the mullet, garfish, seer, barraconta, and horse mackerel, still the mainstay of the fishing and the fish for which the angler generally looks, is what is locally known as " Khokhari."

Caranx carangus and *C. malabaricus* are the two species which are commonest and most often got, but there are altogether nearly thirty sorts of *Caranx* and sometimes one may come across others of the genus than those named above. It is somewhat difficult, without illustrations, to describe our friend. A deep full-bodied fish, something like a perch, body oblong, and more or less compressed, with resplendent scales, high shoulders, a small and shapely head, provided with very powerful tail and fins, lateral line in some species wholly and in others only partially formed, of plate-like scales, each of which is armed with a lateral spinate keen edge, and two dorsals. He is of a distinctly pugnacious and omnivorous nature, appears always ready to be hooked, and like the Irishman always spoiling for a fight, and what is better still, there is no trouble in finding him ; he is nearly always all over the place.

There are times and seasons just as at Aden, when the waters swarm with the small sardines or fry of many sorts of fish, chiefly I believe of the *Atherinides*, large quantities of which are caught in the nets, and are eaten by the European and called "white bait," and then the "Khokhari" is at his busiest. He will follow the shoals of small fish into the shallowest water, and a very favourite place to angle from, and one of the best when the fry were about, is the principal pier or landing place for Ross Island. Standing there and looking down into the pellucid waters, one can see and almost count every fish that comes near. Then a time comes when you see the ordinarily white sandy bottom clouded and darkened in colour, and unless you were prepared for it, you would hardly realise that the darkness was caused by a dense mass of small fish. Such, however, is the case, and where these are, our friend the *Caranx* is sure to be.

Naturally also it follows that the very best bait for him at such seasons is the sardine or smelt, and it should be just lightly hooked and allowed to roam. Such a bait is irresistible, and many and many a good fish have I had in this way. Of the two species noted above, the *Caranx carangus* is by far the better. He grows much bigger, and is also the handsomer fish. In colour he ranges from a bluish silvery sheen on the back, to a golden colour below, and in season his fins appear to be of beaten gold. Scales not particularly large, are inclined to be loose and come off easily, while curiously enough at times they disappear altogether along the anterior portion of the abdomen, and up to and around the pectoral fins ; and on the smaller and immature fish are four or five vertical bands very like what are seen on a perch. His size may be anything from 3lbs. to 70lbs. Very ordinary fish run from 16lbs. to 25lbs. The record "Khokhari" was killed, I believe, in 1893 or 1894 by Lieut. A. ——— of the 14th Madras Native Infantry while stationed there, and weighed 72lbs. This fish was not caught from the pier, but a little further out, where the small station steamer was lying at anchor. The officers on board were at breakfast. A rod had been left over the side, when the bait was suddenly taken. Eventually Lieut. A. ——— had to take to a dinghy and follow the fish about, but it was landed in the long run, after a contest lasting considerably over an hour. Bait, I believe—but of this I am not quite sure now—was a half boiled potatoe. The other species, *viz., Caranx malabaricus,* is also a good fish, and a handsome fish, but is said never to grow anything like as large as his *confrère*, nor is he so brilliantly coloured. His back is a dull bluish-grey, sides silvery shot with purple, while his fins are a pale yellow, dorsal fins and tail grey with spots. Both species, however, give very good sport. When hooked there is just a whisk of their tail and they are off, and their first run is grand, any check and you will lose your fish, but they do not fight brilliantly up to the end. After the first run or two they are given to boring heavily round and round, and if you have a heavy fish on, your rod is likely to suffer a great deal more from them than from any other fish I know, for towards the end it is a case of "Pull Devil, Pull Baker" to get them within reach of net or gaff. But the *Caranx* is by no means the only fish that the angler has to depend on. As in Aden, so here, when the sardines appear large numbers of Barraconta, seer fish, and large gar fish and horse makerel appear also, and you may vary your sport considerably by taking a boat and towing a live bait about slowly—a form of fishing very similar in fact to what is known in Scotland as "harling." Then again on the outlying reefs you will, if you fancy it, get the red rock cod, known locally as "gobra." These often run very large and very heavy. One big fish for a long time took up his quarters among the piles of the landing stage at Port Blair, and though often hooked, always eluded capture by breaking away in among the piles. Apparently his favourite amusement was to lie "dog o!" and as soon as he saw any other fish in difficulties, struggling at the end of a line for instance, as he often did, he just used to open a huge carpet bag of a mouth and closing it on his unfortunate victim, to clear out with the best part of a fish and leave only the head to the angler. I have known of his taking fish up to 6lbs. in weight thus, when they were hooked, and the curses that were launched at his devoted head were many and deep. He fell a victim himself eventually, I believe, to a havildar or sergeant in the Police who inveigled him into taking a bait about 2lbs. in weight, upon what was practically a small shark hook mounted upon stiff wire, and he weighed somewhere about 65lbs. It is not easy within the limits of a short paper to enumerate all the different fish that can be got here, and to specify also the different means adopted for "sarcumventing" the same, but to your angling readers this will not be at all necessary. Any man who is a keen angler, on finding himself in such a place, will most certainly very soon find out for himself all that is really necessary, and thereafter his innate power of inventiveness will lead him on until he will probably become a great deal more expert than I am, and will know more than ever I can hope to teach him. Of the fishing for mullet and gar fish, I have written in detail on a former occasion, so will not refer to it. It is generally only necessary to give hints, &c., but I do not think that any mention of Port Blair fishing would be complete without a passing reference to the atherine or smelt fishing that is occasionally to be obtained.

Whether or not the fish I refer to be a true smelt I know not, but all I know is that they are very like them ; and also that as a change from the heavy coarse fishing I have been describing, it is a real treat to turn away at times from the large sea rod, reel, and lines, which are so necessary for *Caranx*, barraconta, seerfish and gobra—and taking down one's 10ft. toy to go down and have a turn at something smaller and more delicate. From my own personal knowledge, there is only one place where these fish are to be had, though I have no doubt there are many other quiet nooks which these fish affect ; but the place I refer to is not far from the landing place on Aberdeen Island. The tide or surf breaks very quietly in there, and there is a fringe of semi-submerged rocks and sand upon which the wavelets break, and here sometimes the smelt are found in great numbers. I always used the soft tail part of a hermit crab for bait, a two-hook Stewart tackle, an ordinary trout gut cast, and cast for them as one would do when clear water worming, just outside where the line of foam—caused by the break and wash of the tide—appeared, and if they were there one could very soon fill one's creel, and they were excellent for the table. They seldom exceed 6 to 6½ inches in length. It is, I believe, the *Atherina forskalii* of Day. Great numbers are caught in the nets about the coasts and bays, but they are not as a rule so large, seldom more than 3 to 3½ inches, and are always spoken of as "Whitebait." It is unnecessary for me to lay down times and places here for the Port Blair fishing. The place is naturally such a harbour of refuge, and happy hunting ground, that its waters seem always to teem with fish life. Any time will do for a trial, but of course as I have said the best times are when the fry are about ; the fish then are more in evidence, and one need lose no time in looking for them. Then the pier or jetty is as good a place as any. At other times out near the station steamer buoy, used in my day (now some years ago) to be considered a very good place indeed, and for harling most of us trailed about a bait, whenever we went anywhere, just as a matter of course, and on the off chance of a fish. Again near the sunken wreck of the Indian Marine Steamer "Enterprise," which was blown ashore in the great cyclone in 1891, there is a reef which used to be good for the golden *Caranx*, and off the rocks, near the Post Office, was a favourite resort for catching the rock and coral fish which we often wanted for bait when sardines were scarce or unobtainable, but in fact most places are good down there, and one need not bother much where to go. The rule always was to go out and trust to luck. With regard to bait ; far away the best bait for any or all of these predacious fish is the fry, or sardine so called ; and you may vary the size to suit the fish you are after ; but ordinarily a 4 oz. bait would be found large enough. Often however sardines are not procurable, and then you must go and catch your bait upon the rocks. As in Aden so here you will find that an hour or two's angling will produce the most curious collection of brilliantly coloured, but rather evil smelling, rock fish, and these are excellent in their way, and are not despised by the larger fish. At times you may try our old friend "Sarcelle" with advantage, or even make a weird and curious representation of a flying fish with cotton wool, silver or tin foil, and a white or red rag, and drag the whole skipping along on the top of the water. This is best done when sailing along with a brisk breeze, and to your counterfeits flying fish shall be taken with such a splash and a rush, that shall make your heart flutter, and after a grand fight you will find that you have got a "barracouta." Here again the inventiveness of the angler will have full scope, and many a man has his own particular lure, which he fondly believes is better than any other. I had a very good arrangement once. A deadly scheme of triangles something like a Thames pike flight, and from each hook depended a strip of cotton tape, each cut to different lengths, and they all wobbled and waved when being towed in a manner that fascinated many a fish.

For the smelt nothing is so good as the soft tail of a hermit crab. The crab itself is easily got. They swarm on the beach, and if you will only sit still, you will see the old shells lying on the beach begin to move, and then walk about: rather embarrassing to a stranger sometimes, who begins to wonder whether he is seeing right or not, but a little investigation soon shews him the cause. In each of these shells a crab has taken up his abode. You have got your crab now but the question is how to remove him. Pull him out you cannot, while if you break the shell (in itself not such an easy job), you generally mash up the occupant. I give you a tip for what it is worth. Perchance you may be smoking; well, if so, take the shell, and hold it quietly for a minute or so with the back or closed end of the shell near the business end of your cheeroot, and in a short time the hermit will, begin to wonder what is up with his hind quarters, and as the heat increases he will very quickly and suddenly evacuate his fortress, and then you have him at your mercy.

While on the subject of hermit crabs and shells, I would remark that any one with a taste for conchology would here be in his element, for he can gather here with very little trouble a wonderful collection. Some of the reefs here about abound with beautifully marked tiger-cowries, and curious and spikey specimens of all sorts and sizes are to be had. I say of all sorts and sizes advisedly. In the one case I know a reverend gentleman who sorted out 1,500 complete shells and for safety stowed them away with cotton wool in an ordinary small homeopathic medicine bottle; while down in the Nicobars in a quiet bay, on a shallow reef which is very nearly dry at low water, I know of the existence of a huge tridacne, or clam, each half of which would make a very decent bath for a man, and I moreover tried one day for hours, with a crowbar and six men to detach him from the ledge where he had anchored himself. When we commenced operations, he simply shut himself up, tightened his hold on the rocks, and utterly defeated me.

I have however at different times obtained some very decent specimens of tridacne, and at one time possessed a set of desert dishes, which were simply the half shell. All the miscellaneous marine growth which was on them originally had been allowed to dry up and remain; and as desert dishes they were certainly unique. I was very sorry when, through no fault of my own, I lost them.

And now for the gear required. I have on one or two occasions before fully described the class of rod, reel, line and trace required for general sea-fishing, so that I will not long detain you. What I have said before regarding rods and reels here holds good, but in the case of Port Blair fishing, there is one alteration in the way of traces, that is imperative. In Bombay the water never pretends to be very clear; in Aden though it is much clearer, still when compared with the absolutely clear and pellucid waters about the Andamans, it is as "muddy tub swipes" to a glass of Perrier Jouet; hence the twisted brass wire traces which are so suitable for the two first named places are entirely out of it here. Nothing but the very finest gear will do, and when you come to consider the class of fish you are likely to get, you will understand that it has been no easy task to get a trace that shall be sufficiently invisible, and yet sufficiently strong. Gut is of no use at all. There is a metal worker out here in Delhi, who makes a perfectly lovely steel wire. Originally intended for the strings of some native musical instrument, it was taken up by some keen fisherman, and it is to be had occasionally, but only in limited quantities. Men who use this, use it triple, as it is less likely to kink. I only once managed to get any, but since then I have used a very decent nice wire, supplied by Robertson of Bothwell Street, Glasgow, who, I understand, has sent out several lots since then, to the Andamans, direct to order. I don't know the gauge, but in thickness it is about the size of linen thread, and costs 3*s.* a pound. I have found this suitable in every respect, finely tempered, and put up in large coils. When a piece is cut off, it springs out quite straight, and as long as it is kept free from kinks, it is amply strong enough for anything. These traces must be well mounted with swivels blackened or bronzed to suit the colour of the wire. On the other hand the disadvantages of using these traces are, that the action of the salt water affects the steel to such an extent that they only last for a few hours; can certainly not be used a second time; in fact, I have felt them roughened and pitted, after a couple of hours' immersion, and I change at once as soon as I feel this; and secondly, if perchance a kink should occur, they part with the first strain. However as one gets several thousand feet for about 5*s.* and as each trace is as a rule not more than 6 ft. long, it is not ruinous to discard them when once they become doubtful.

To wind up with; it is not very likely that many of my readers will ever have an opportunity, or perhaps even the wish, to visit these places, but in case any one should wish to go, I must point out, not with any idea of damping his ardour, that on account of its being a penal settlement, that it is not easy to obtain permission to stay there, unless with friends. All the house accommodation is the property of Government, and no more is provided than is necessary for the requirements of the settlement officers, and all Europeans there resident are officials. In fact, it is a pretty close preserve. One can of course visit the place by taking a passage for the round voyage either from Madras or Calcutta ; but in doing this, though one sees the beauties of the Islands one gets no time to loaf about, enjoy the place, or fish. Once the steamer has left, it is entirely cut off from the world. As there is no telegraphic communication and until the steamer again comes round, they may truly be said to be in, but not of the world. This old world state of affairs constitutes one of the chief charms of Port Blair, and the Andamans, in these days of rush and skurry to the older generation, though the younger and more ardent spirits often find that time hangs heavy on their hands.

LIST OF INDIAN BIRDS' EGGS

IN THE BOMBAY NATURAL HISTORY SOCIETY'S COLLECTION

on 1st August, 1899.

No. in F.Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Order—PASSERES.		
		Family—CORVIDÆ.		
4	660	*Corvus macrorhynchus*	The Jungle Crow	2
7	663	„ *splendens*	The Indian House Crow	4
14	673	*Cissa chinensis*	The Green Magpie	3
16	674	*Dendrocitta rufa*	The Indian Tree-pie	4
18	676	„ *himalayanus*	The Himalayan Tree-pie	9
19	677	„ *frontalis*	The Black-browed Tree-pie	2
31	645	*Parus atriceps*	The Indian Grey Tit	2
34	..	„ *monticola*	The Green-backed Tit	3
61	374	*Scæorhynchus gularis*	The Hoary-headed Crow-Tit	3
		Family—CRATEROPODIDÆ.		
62	410	*Dryonastes ruficollis*	The Rufous-necked Laughing Thrush	3
69	407	*Garrulax leucolophus*	The Himalayan White-crested Laughing Thrush	2
72	412	„ *pectoralis*	The Black-gorgeted Laughing Thrush	5
73	413	„ *moniliger*	The Necklaced Laughing Thrush	6
74	409 ter.	„ *gularis*	McCelland's Laughing Thrush	4
80	421	*Ianthocincla rufigularis*	The Rufous-chinned Laughing Thrush	1
84	415 bis.	*Trochalopterum chrysopterum*	The Eastern Yellow-winged Laughing Thrush	3
87	422	„ *phœniceum*	The Crimson-winged Laughing Thrush	2
91	...	„ *simile*	The Western Variegated Laughing Thrush	2
98	425 bis.	„ *virgatum*	The Manipur Streaked Laughing Thrush	1
103	413 bis.	*Stactocichla merulina*	The Spotted-breasted Laughing Thrush	3
104	439	*Argya earlii*	The Striated Babbler	1
105	438	„ *caudata*	The Common Babbler	4
107	436	„ *malcolmi*	The Large Grey Babbler	4
110	432	*Crateropus canorus*	The Jungle Babbler	3
116	402	*Pomatorhinus schisticeps*	The Slaty-headed Scimitar Babbler	3
121	404 ter.	„ *obscurus*	Hume's Scimitar Babbler	2
122	401	„ *ferruginosus*	The Coral-billed Scimitar Babbler	2
134	396	*Timelia pileata*	The Red-capped Babbler	1
135	397	*Dumetia hyperythra*	The Rufous-bellied Babbler	2
139	385	*Pyctorhis sinensis*	The Yellow-eyed Babbler	4
142	399 bis.	*Pellorneum mandellii*	Mandelli's Spotted Babbler	4
144	399	„ *ruficeps*	The Spotted Babbler	2
148	399 ter.	„ *ignotum*	The Assam Babbler	3
151	399 ter.A.	*Drymocataphus tickelli*	Tickell's Babbler	2
163	388	*Alcippe nepalensis*	The Nepal Babbler	5
164	389	„ *phæocephala*	The Nilgiri Babbler	2
165	388 bis.	„ *phayrii*	The Burmese Babbler	4
169	391	*Stachyrhis nigriceps*	The Black-throated Babbler	1
170	394	„ *chrysæa*	The Golden-headed Babbler	3
172	393	*Stachyrhidopsis ruficeps*	The Red-headed Babbler	2
187	343	*Myiophoneus temmincki*	The Himalayan Whistling Thrush	4
189	342	„ *horsfieldi*	The Malabar Whistling Thrush	2
191	...	*Larvivora brunnea*	The Indian Blue Chat	2
198	336	*Drymochares nepalensis*	The Nepal Short-wing	10

No. in F. Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
201	328	*Thesia cyaniventris*	The Slaty-bellied Short-wing	2
211	427	*Actinodura egertoni*	The Rufous Bar-wing	3
226	631	*Zosterops palpebrosa*	The Indian White-eye	4
228	631 B.	„ *simplex*	The Swinhoe's White-eye	4
232	623	*Ixulus flavicollis*	The Yellow-naped Ixulus	3
243	468	*Ægithina tiphia*	The Common Iora	3
245	468 bis.	„ *nigrilutea*	Marshall's Iora	1
257	615	*Mesia argentauris*	The Silver-eared Mesia	4
262	269 quat.	*Hypocolius ampelinus*	The Grey Hypocolius	4
263	451	*Criniger flaveolus*	The White-throated Bulbul	2
269	444	*Hypsipetes psaroides*	The Himalayan Black Bulbul	1
272	448	*Hemixus favala*	The Brown-eared Bulbul	2
278	462	*Molpastes hæmorrhous*	The Madras Red-vented Bulbul	4
279	461	„ *burmanicus*	The Burmese Red-vented Bulbul	3
284	458	„ *leucogenys*	The White-cheeked Bulbul	2
288	460	*Otocompsa emeria*	The Bengal Red-whiskered Bulbul	1
289	460 bis.	„ *fuscicaudata*	The Southern Red-whiskered Bulbul	3
290	456	„ *flaviventris*	The Black-crested Yellow Bulbul	2
305	452	*Pycnonotus luteolus*	The White-browed Bulbul	2
		Family—DICRURIDÆ.		
327	278	*Dicrurus ater*	The Black Drongo	6
328	280	„ *longicaudatus*	The Indian Ashy Drongo	1
333	280 bis.	„ *cineraceus*	The Grey Drongo	4
334	280 280 bis.	*Chaptia ænea*	The Bronzed Drongo	4
335	286	*Chibia hottentotta*	The Hair-crested Drongo	2
339	283	*Bringa remifer*	The Lesser Racket-tailed Drongo	6
340	284 285	*Dissemurus paradiseus*	The Larger Racket-tailed Drongo	2
		Family—CERTHIIDÆ.		
257	330	*Pnœpyga pusilla*	The Brown Wren	3
363	......	*Acrocephalus stentoreus*	The Indian Great Reed-warbler	4
		Family—SYLVIIDÆ.		
374	530	*Orthothomus sutorius*	The Indian Tailor-bird	11
381	541 bis. 539 539 bis.	*Cisticola cursitans*	The Rufous Fantail-warbler	5
382	536 538 536 ter.	*Franklinia gracilis*	Franklin's Wren-warbler	12
383	536 bis. 538 bis. 535 bis.	„ *rufescens*	Beavan's Wren-warbler	6
384	551	„ *buchanani*	The Rufous-fronted Wren-warbler	3
402	582	*Sylvia affinis*	The Indian Lesser White-throated Warbler	1
448	552 bis. 526	*Horornis fortipes*	The Strong-footed Bush-warbler	3
458	548 549 quat 547	*Suya criniger*	The Brown Hill-warbler	1
463	532	*Prinia flaviventris*	The Yellow-bellied Wren-warbler	3
464	534 535 535	„ *socialis*	The Ashy Wren-warbler	4

No. in F. Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
465	544 bis. 545 545 bis. 545 ter. 546	*Prinia sylvatica*	The Jungle Wren-warbler	9
466	543 543 bis. 544	„ *inornata*	The Indian Wren-warbler	2
		Family—LANIIDÆ.		
469	256	*Lanius lahtora*	The Indian Grey Shrike	2
473	260	„ *vittatus*	The Bay-backed Shrike	3
475	259	„ *nigriceps*	The Black-headed Shrike	2
476	257 bis. 257	„ *erythronotus*	The Rufous-backed Shrike	8
488	265	*Tephrodornis pondicerianus*	The Common Wood-shrike	2
501	277	*Pericrocotus erythropygius*	The White-bellied Minivet	3
510	270	*Graucalus macii*	The Large Cuckoo-shrike	1
512	287	*Artamus fuscus*	The Ashy Swallow Shrike	3
		Family—ORIOLIDÆ.		
518	470	*Oriolus kundoo*	The Indian Oriole	3
		Family—STURNIDÆ.		
529	682	*Sturnus humii*	The Himalayan Starling	4
538	688	*Sturnia malabarica*	The Grey-headed Myna	5
544	687	*Temenuchus pagodarum*	The Black-headed Myna	2
549	684	*Acridotheres tristis*	The Common Myna	3
551	685	„ *ginginianus*	The Bank Myna	3
552	686	*Æthopsar fuscus*	The Jungle Myna	1
555	683	*Sturnopastor contra*	The Pied Myna	3
568	......	*Cyornis superciliaris*	The White-browed Blue Flycatcher	3
		Family—MUSCICAPIDÆ.		
575	304	*Cyornis rubiculoides*	The Blue-throated Flycatcher	3
576	305 306	„ *tickelli*	Tickell's Blue Flycatcher	3
579	301	*Stoparola melanops*	The Verditer Flycatcher	3
581	302	„ *albicaudata*	The Nilgiri Blue Flycatcher	1
588	297	*Alseonax latirostris*	The Brown Flycatcher	4
590	299 ter. 307 bis.	„ *muttui*	Layard's Flycatcher	1
595	304	*Niltava macgrigoriæ*	The Small Niltava	2
598	288	*Terpsiphone paradisi*	The Indian Paradise Flycatcher	3
599	289	„ *affinis*	The Burmese Paradise Flycatcher	5
601	290	*Hypothymis azurea*	The Indian Black-naped Flycatcher.	6
604	292	*Rhipidura albifrontata*	The White-browed Fantail Flycatcher	3

No. in F.Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
605	291	*Rhipidura albicollis*	The White-throated Fantail Fly-catcher	2
607	293	„ *pectoralis*	The White-spotted Fantail Fly-catcher	3
		Family—TURDIDÆ.		
608	481	*Pratnicola caprata*	The Common Pied Bush-chat	4
609	482	„ *atrata*	The Southern Pied Bush-chat	6
629	194	*Cercomela fusca*	The Brown Rock-chat	6
631	584 bis.	*Henicurus guttatus*	The Eastern Spotted Forktail	3
632	586	„ *schistaceus*	The Slaty-backed Forktail	2
633	585	„ *immaculatus*	The Black-backed Forktail	3
659	477	*Notodela leucura*	The White-tailed Blue Robin	2
661	480	*Thamnobia cambaiensis*	The Brown-backed Indian Robin	2
662	479	„ *fulicata*	The Black-backed Indian Robin	8
663	475	*Copsychus saularis*	The Magpie Robin	4
671	359	*Merula nigripileus*	The Black-capped Blackbird	3
673	663	„ *castanea*	The Grey-headed Ouzel	3
676	361	„ *boulboul*	The Grey-winged Ouzel	1
678	356	„ *unicolor*	The Tickell's Ouzel	4
685	354	*Geocichla cyanonotus*	The White-throated Ground Thrush.	2
686	355	„ *citrina*	The Orange-headed Ground Thrush,	4
691	353	*Petrophila cinclorhyncha*	The Blue-headed Rock Thrush	4
695	368	*Turdus viscivorus*	The Misel-Thrush	3
705	350 bis.	*Zoothera marginata*	The Lesser Brown Thrush	3
		Family—PLOCEIDÆ.		
720	694	*Ploceus baya*	The Baya	3
721	694 bis. 694 ter.	„ *megarhynchus*	The Eastern Baya	2
722	696	„ *bengalensis*	The Black-throated Weaver-bird	3
723	695	„ *manyar*	The Striated Weaver-bird	9
726	698	*Munia atricapilla*	The Chestnut-bellied Munia	2
727	702	*Uroloncha acuticauda*	Hodgson's Munia	1
734	703	„ *malabarica*	The White-throated Munia	10
735	699	„ *punctulata*	The Spotted Munia	2
		Family—FRINGILLIDÆ.		
776	706	*Passer domesticus*	The House Sparrow	3
779	710	„ *montanus*	The Tree Sparrow	4
780	708	„ *cinnamomeus*	The Cinnamon Tree Sparrow	3
803	724	*Melophus melanicterus*	The Crested Bunting	3
		Family—HIRUNDINIDÆ.		
809	89	*Cotile sinensis*	The Indian Sand-Martin	3
811	90	*Ptyonoprogne rupestris*	The Crag-Martin	2
813	82	*Hirundo rustica*	The Swallow	5
814	82 bis.	„ *gutturalis*	The Eastern Swallow	2
818	84	„ *smithii*	The Wire-tailed Swallow	6
819	86	„ *fluvicola*	The Indian Cliff-swallow	10
823	85	„ *erythropygia*	Syke's Striated Swallow	2
		Family—MOTACILLIDÆ.		
830	589 bis.	*Motacilla hodgsoni*	Hodgson's Pied Wagtail	4
831	581	„ *maderaspatensis*	The Large Pied Wagtail	3

No. in F. Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Family—ALAUDIDÆ.		
847	600	*Anthus rufulus*	The Indian Pipit	1
871	756	*Mirafra erythroptera*	The Red-winged Bush Lark	2
875	765	*Galerita deva*	Sykes's Crested Lark	2
877	758	*Ammomanes phœnicura*	The Rufous-tailed Finch Lark	3
879	760	*Phyrrulauda grisea*	The Ashy-crowned Finch Lark	2
		Family—NECTARINIIDÆ.		
895	234	*Arachnechthra asiatica*	The Purple Sun-bird	2
		Family—DICÆIDÆ.		
906	223	*Arachnothera magna*	The Large Streaked Spider-hunter	2
921	240	*Piprisoma squalidum*	The Thick-billed Flower-pecker	1
		Family—PITTIDÆ.		
927	344	*Pitta nepalensis*	The Blue-naped Pitta	3
933	345	„ *brachyura*	The Indian Pitta	2
942	139 bis.	*Serilophus lunulatus*	Gould's Broadbill	4
943	139	„ *rubripygius*	Hodgson's Broadbill	4
		Order.—EURYLÆMI.		
		Family—EURYLÆMIDÆ.		
944	138	*Psarisomus dalhousiæ*	The Long-tailed Broadbill	5
		Order.—PICI.		
		Family—PICIDÆ.		
950	172	*Gecinus occipitalis*	The Black-naped Green Woodpecker	6
951	174	„ *chlorolophus*	The Small Himalayan Yellow-naped Wood-pecker	1
972	160	*Liopicus mahrattensis*	The Yellow-fronted Pied Woodpecker	2
986	180	*Brachypternus aurantius*	The Golden-backed Woodpecker	3
992	166 166 bis.	*Chrysocolaptes gutticristatus*	Tickell's Golden-backed Woodpecker	1
		Order.—ZYGODACTYLI.		
		Family—CAPITONIDÆ.		
1007	191 bis.	*Megalæma virens*	The Great Chinese Barbet	1
1008	193 193 ter. 193 bis.	*Thereiceryx zeylonicus*	The Common Indian Green Barbet	3
1012	195	*Cyanops asiatica*	The Blue-throated Barbet	4
1017	196	„ *franklini*	The Golden-throated Barbet	2
1019	197	*Xantholæma hemacephala*	The Crimson-breasted Barbet	3

No. in F.Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Order.—ANISODACTYLI.		
		Family—CORACIADÆ.		
1022	123	*Coracias indica*	The Indian Roller	3
1024	125	„ *garrula*	The European Roller	1
		Family—MEROPIDÆ.		
1026	117	*Merops viridis*	The Common Indian Bee-eater	3
1027	118	„ *phillipinus*	The Blue-tailed Bee-eater	1
1029	121	„ *apiaster*	The European Bee-eater	1
		Family—ALCEDINIDÆ.		
1033	136	*Ceryle varia*	The Indian Pied Kingfisher	9
1035	134	*Alcedo ispida*	The Common Kingfisher	7
1044	129	*Halcyon smyrnensis*	The White-breasted Kingfisher	2
1062	144	*Lophoceros birostris*	The Common Grey Hornbill	2
1065	146quint	*Rhinoplax vigil*	The Helmeted Hornbill	1
		Family—UPUPIDÆ.		
1066	254	*Upupa epops*	The European Hoopoe	4
		Order.—MACROCHIRES.		
		Family—CYPSELIDÆ.		
1073	100	*Cypselus affinis*	The Common Indian Swift	5
1075	102	*Tachornis batassienis*	The Palm Swift	3
1076	102 bis.	„ *infumatus*	The Eastern Palm Swift	...
		Family—CAPRIMULGIDÆ.		
1090	114	*Caprimulgus monticola*	Franklin's Nightjar	2
1091	112	„ *asiatica*	The Common Indian Nightjar	3
1093	109	„ *macrurus*	Horsfield's Nightjar	...
		Family—PODARGIDÆ.		
1097	106	*Batrachostomus hodgsoni*	Hodgson's Frogmouth	1
		Order.—TROGONES.		
		Family—TROGONIDÆ.		
1101	116	*Harpactes erithrocephalus*	TheRed-headed Trogan	3
		Order.—COCCYGES.		
		Family—CUCULOIDÆ.		
1118	212	*Coccystes jacobinus*	The Pied-crested Cuckoo	6
1120	214	*Eudynamis honorata*	The Indian Koel	5
1123	215	*Rhopodytes tristis*	The Large Green-billed Malkoha	2
1129	219	*Taccogua leschenaulti*	The Sirkeer Cuckoo	3
1130	217	*Centropus sinensis*	The Crow Pheasant	3
1133	218	„ *bengalensis*	The Lesser Coucal	2

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		Order.—PSITTACI.		
		Family—PSITTACIDÆ.		
1138	148	*Palæornis torquatus*	The Rose-ringed Paroquet	3
1139	149	„ *cyanocephalus*... ...	The Western Blossom-headed Paroquet	3
1141	150	„ *schisticeps*	The Slaty-headed Paroquet	2
		Order.—STRIGES.		
		Family—STRIGIDÆ.		
1168	60	*Bubo bengalensis*	The Rock-horned Owl...	2
1169	70	„ *coromandus*	The Dusky-horned Owl	1
1180	76	*Athene brama*	The Spotted Owlet	3
1184	77	*Glaucidium radiatum*	The Jungle Owlet	2
		Order.—ACCIPITRES.		
		Family—VULTURIDÆ.		
1191	2	*Otogyps calvus*	The Black Vulture	1
1194	4	*Gyps indicus*	The Indian Long-billed Vulture ...	1
1196	5	*Pseudogyps bengalensis*	The Indian White-backed Vulture ...	1
1197	6	*Neophron ginginianus*	The Smaller White Scavenger Vultur	2
		Family—FALCONIDÆ.		
1203	29	*Aquila vindhiana*...	The Indian Tawny Eagle	2
1207	33	*Hieraëtus fasciatus*	Bonelli's Eagle...	1
1216	38	*Circaëtus gallicus*...	The Short-toed Eagle...	1
1220	40	*Butaster teesa*	The White-eyed Buzzard Eagle ...	2
1223	42	*Haliaëtus leuchoryphus*	Pallas's Fishing Eagle	1
1224	43	„ *leucogaster*	The White-bellied Sea Eagle ...	1
1226	41	*Polioaëtus ichthyaëtus*	The Large Grey-headed Fishing Eagle	2
1228	55	*Haliastur indus*	The Brahminy Kite	2
1229	56	*Milvus govindah*	The Pariah Kite	2
1232	59	*Elanus cœruleus*	The Black-winged Kite	4
1244	23	*Astur badius*	The Shikra	...
1247	24	*Accipiter nisus*	The Sparrow Hawk	3
1257	11	*Falco jugger*	The Laggar Falcon	1
1264	16	*Æsalon chicquera*	The Red-headed Merlin	3
		Order—COLUMBÆ.		
		Family—COLUMBIDÆ		
1273	776	*Osmotreron phayrei*	The Ashy-headed Green Pigeon ...	2
1278	774	„ *bicincta*	The Orange-headed Green Pigeon ...	1
1281	771	*Treron nepalensis*	The Thick-billed Green Pigeon ...	2
1282	779	*Spenocercus apicicaudata* ...	The Pin-tailed Green Pigeon ...	4
1283	778	„ *sphenurus*	The Kokla Green Pigeon	3
1291	798	*Calcophaps indica*	The Bronze-winged Dove	2
1292	788	*Columbia intermedia*	The Indian Blue Rock Pigeon ...	2
1307	795	*Turtur suratensis*	The Spotted Dove	1
1309	794	„ *cambayensis*	The Little Brown Dove	1
1312	802	*Macropygia tusalia*	The Bar-tailed Cuckoo Dove ...	1

No. in F.Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Order—PTEROCLETES.		
		Family—PTEROCLIDÆ.		
1321	802	*Pterocles exustus*	The Common Sand Grouse	2
		Order—GALLINÆ.		
		Family—PHASIANIDÆ.		
1324	803	*Pavo cristata*	The Common Pea Fowl	2
1328	812	*Gallus ferruginous*	The Red Jungle Fowl	4
1330	815	,, *sonerati*	The Grey Jungle Fowl	1
1339	810 ter.	*Gennœus horsfieldi*	The Black-breasted Kalij Pheasant	1
1342	804	*Lophophorus refulgens*	The Monal	1
1349	814	*Galloperdix spadiceus*	The Red Spur Fowl	5
1351	815 bis.	,, *bicalcarata*	The Ceylon Spur Fowl	2
1352	825quint	*Bambusicola flytchii*	The Western Bamboo Partridge	3
1356	830	*Coturnix coromandelica*	The Black-breasted or Rain Quail	5
1357	826	,, *asiatica*	The Jungle Bush Quail	2
1363	825	*Arboricola rufigularis*	Blyth's Hill Partridge	2
1365	824 bis.	,, *atrigularis*	The White-cheeked Hill Partridge	2
1370	820	*Caccabis chucar*	The Chukor	3
1372	818	*Francolinus vulgaris*	The Black Partridge	1
1373	819	,, *pictus*	The Painted Partridge	1
1375	822	,, *pondicerianus*	The Grey Partridge	2
1377	823 bis.	*Perdix hodgsoniæ*	The Tibetan Partridge	6
1378	816	*Tetraogallus himalayensis*	The Himalayan Snow-cock	2
		Family—MEGAPODIIDÆ.		
1381	803 oct	*Megapodius nicobariensis*	The Nicobar Megapode	1
		Order—HEMIPODII.		
		Family—TURNICIDÆ.		
1382	832 833	*Turnix pugnax*	The Bustard Quail	4
		Order—GRALLÆ.		
		Family—RALLIDÆ.		
1389	913	*Hypotœnidia striata*	The Blue-breasted Banded Rail	6
1398	911	*Amaurornis fuscus*	The Ruddy Crake	3
1400	908	,, *akool*	The Brown Crake	1
1401	907	,, *phœnicurus*	The White Breasted Water-hen	6
1402	905	*Gallinula chloropus*	The Moor-hen	7
1404	902	*Porphyrio poliocephalus*	The Purple Moor-hen	2
1405	903	*Fulica atra*	The Coot	3
		Family—GRUIDÆ.		
1409	863	*Grus antigone*	The Sarus	2
		Family—OTIDIDÆ.		
1413	836 ter.	*Otis tetrax*	The Little Bustard	1
1414	836	*Eupodotis edwardsi*	The Great Indian Bustard	3
1416	839	*Sypheotis aurita*	The Lesser Florican	1

No. in F.Brit. India.	No in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Order—LIMICOLÆ.		
		Family—ŒDICNEMIDÆ.		
1418	859	*Œdicnemus scolopax*	The Stone Curlew	...
		Family—DROMADIDÆ.		
1421	861	*Dromas ardeola*	The Crab Plover	2
		Family—GLAREOLIDÆ.		
1422	840	*Cursorius coromandelicus*	The Indian Courser	2
1427	843	*Glareola lactea*	The Small Indian Partincole or Swallow Plover	1
		Family—PARRIDÆ.		
1428	900	*Metopidius indicus*	The Bronze-winged Jacana	6
1429	901	*Hydrophasianus chirurgus*	The Pheasant-tailed Jacana	4
		Family—CHARADRIIDÆ.		
1431	855	*Sarcogrammus indicus*	The Red-wattled Lapwing	4
1433	856	*Sarciophorus malabaricus*	The Yellow-wattled Lapwing	3
1435	857	*Hoplopterus ventralis*	The Indian Spur-Winged Plover	2
1443	847	*Ægialitis mongolica*	The Lesser Sand Plover	4
1446	848	„ *alexandrina*	The Kentish Plover	2
1447	850 849	„ *dubia*	The Little Ringed Plover	2
1451	898	*Himantopus candidus*	The Black-winged Stilt	1
1468	880	*Pavoncella pugnax*	The Ruff	1
1476	881 bis.	*Tringa crassirostris*	The Eastern Knot	2
1478	883	*Tringa alpina*	The Dunlin	1
1488	873	*Rostratula capensis*	The Painted Snipe	2
		Order—GAVIÆ.		
		Family—LARIDÆ.		
1492	981 ter.	*Larus hemprichi*	The Sooty Gull	2
1496	984	*Hydrochelidon hybrida*	The Whiskered Tern	4
1498	982	*Hydroprogne caspia*	The Caspian Tern	2
1501	990	*Sterna media*	The Smaller Crested Tern	3
1502	989	„ *bergii*	The Larger Crested Tern	2
1503	985	„ *seena*	The Indian River Tern	4
1504	987	„ *melanogaster*	The Black-bellied Tern	4
1505	987 bis.	„ *albigena*	The White-cheeked Tern	3
1508	985 bis.	„ *dougalli*	The Roseate Tern	4
1510	988 988quat.	„ *minuta*	The Little Tern	4
1511	988 ter.	„ *saundersi*	The Black Shafted Ternlet	4
1513	992	„ *anætheta*	The Panyan Tern	5
		Order—STEGANOPODES.		
		Family—PHALACROCORACIDÆ.		
1526	1005	*Phalacrocorax carbo*	The Large Cormorant	3
1527	1006	„ *fuscicollis*	The Indian Shag	2
1528	1007	„ *javanicus*	The Little Cormorant	3
1529	1008	*Plotus melanogaster*	The Indian Darter or Snake Bird	2

No. in F.Brit. India.	No. in Jerdon.	Scientific Name.	English Name.	No. of Eggs.
		Order—HERODIONES.		
		Family—IBIDIDÆ.		
1541	941	*Ibis melanocephala*	The White Ibis	2
		Family—PLATALEIDÆ.		
1545	939	*Platalea leucorodia*	The Spoon-bill	2
		Family—CICONIIDÆ.		
1548	920	*Dissura episcopus*...	The White-necked Stork	1
1552	938	*Pseudotantalus leucocephalus* ...	The Painted Stork	4
1553	940	*Anastomus oscitans*	The Open-bill	3
		Family—ARDEIDÆ.		
1554	924	*Ardea manillensis*	The Eastern Purple Heron	2
1555	923	„ *cinerea*	The Common Heron	1
1559	924 bis.	*Herodias alba*	The Large Egret	2
1560	926	„ *intermedia*	The Smaller Egret	3
1561	927	„ *garzetta*	The Little Egret	1
1562	929	*Bubulcus coromandus*	The Cattle Egret	1
1563	928	*Lepterodius asha*	The Indian Reef Heron	4
1565	930	*Ardeola grayi*	The Pond Heron	3
1568	937	*Nycticorax griseus*	The Night Heron	2
1570	935	*Ardetta minuta*	The Little Bittern	2
1572	933	„ *cinnamomea*	The Chestnut Bittern	3
		Order—PHŒNICOPTERI.		
		Family—PHŒNICOPTERIDÆ.		
1575	944	*Phœnicopterus roseus*	The Common Flamingo	1
		Order—ANSERES.		
		Family—ANATIDÆ.		
1584	950	*Sarcidiornis melanonotus* ...	The Comb Duck or Nukta	2
1589	954	*Dendrocycna javanica*	The Whistling Teal	6
1590	953	„ *fulva*	The Larger Whistling Teal	2
1593	959	*Anas pœcilorhyncha*	The Spot-billed Duck	2
1606	969	*Nyroca ferruginea*	The White-eyed Duck	6
1614	...	*Mergus serrator*	The Red-breasted Mergarser ...	2
		Order—PYGOPODES.		
		Family—PODICIPEDIDÆ.		
1615	974	*Podiceps cristatus*	The Great-crested Grebe	1
1617	975	„ *albipennis*	The Indian Little Grebe or Dabchick.	4

DIAGNOSES OF SOME NEW INDIAN *ARACHNIDA*.

By R. I. Pocock (Zool. Dept., British Museum).

The following paper contains brief diagnoses of some new Indian *Arachnida*, kindly obtained for me by various members of the Natural History Society of Bombay. I gladly avail myself of the opportunity to thank all those who have been good enough to interest themselves in the way of procuring material for me, but especially must acknowledge my great indebtedness in this particular to Messrs. Phipson, Millard and Wroughton.

The species here diagnosed will be more fully described and dealt with at greater length in a volume on the Scorpions, Pedipalpi, &c., of British India, now in course of publication as part of the series on the Fauna of India, edited by Dr. W. T. Blanford; and I hope at some future time to have the honour of laying before the Natural History Society of Bombay a series of papers in which these and other Indian species will be re-described, their habits discussed, and their more important structural details carefully illustrated, so that facilities may be provided to naturalists resident in India for a further study of this most interesting branch of the fauna.

Order SCORPIONES.

Genus Chiromachetes, nov.

Allied to the tropical African and Madagascar genus *Opisthacanthus*, but recognisable by having the median eyes far in advance of the middle of the carapace, the lateral eyes marginal.

Chiromachetes fergusoni, sp. n.

Colour.—A tolerably uniform greenish-black above, with the tarsi and vesicle ferruginous; ventral surface yellowish-red.

Carapace and *tergites* smooth, closely punctured; the former deeply excised in the middle of its frontal border. *Tail* slender, punctulate, not granular, and not keeled. *Chelæ* densely punctulate and granular above, long; hand-back nearly twice as long as the width of the hand, longer than the moveable digit, which is strongly lobate and longer than the carapace. *Legs* punctured; femora and tibiæ finely granular; tarsi with 2 posterior and 1 anterior spine beneath.

Total length 100 mm., length of carapace 14.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Genus PALAMNÆUS, Thor.

Palamnœus wroughtoni, sp. n.

Allied to *P. fulvipes*, C. Koch, with the upper surface of the hand of the pincer similarly crested externally, but with the inner border of the hand much more strongly produced below the base of the immove-

CORRECTION.

Vol. XII, page 745, the last species described at bottom of page should be

Labochirus tauricornis, sp. n.,

instead of

Labochirus cervinus, sp. n.,

which is the name of the previous species described above.

the anterior border of the tibial apophysis produced into an obtusely angular prominence instead of being lightly sinuous as in *L. proboscideus*.

Total length of body 30 mm., carapace 11.

Locality.—Mangalore (*T. Battie*).

Labochirus cervinus, sp. n.

♂. Allied both to *L. proboscideus* and *L. cervinus*, but distinguishable by having the inner border of the hand behind the digit more inflated than in *L. cervinus* and less so than in *L. proboscideus*. Moreover, the posterior border of the tibial apophysis is straight; the anterior border is also straighter than in the other species, not sinuous as in *L. proboscideus* and not inflated as in *L. cervinus*; the extremity of the anterior border convexly rounded.

Total length 28 mm., carapace 11.

Locality.—Kanara (*T. R. D. Bell*).

DIAGNOSES OF SOME NEW INDIAN *ARACHNIDA*.

By R. I. Pocock (Zool. Dept., British Museum).

The following paper contains brief diagnoses of some new Indian *Arachnida*, kindly obtained for me by various members of the Natural History Society of Bombay. I gladly avail myself of the opportunity [illegible] good enough to interest themselves in

but [illegible] middle of the carapace, the lateral eyes marginal.

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Total length 100 mm., length of carapace 14.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Genus PALAMNÆUS, Thor.

Palamnœus wroughtoni, sp. n.

Allied to *P. fulvipes*, C. Koch, with the upper surface of the hand of the pincer similarly crested externally, but with the inner border of the hand much more strongly produced below the base of the immoveable digit, and with the legs deep brown in colour instead of reddish-yellow.

Total length 100 mm., carapace 15.

Locality.—Belgaum (*W. A. Talbot*), and Gadingal in Kolhapur (*Col. Wray*).

Order PEDIPALPI.

Genus THELYPHONUS, Latr.

Thelyphonus muricola, sp. n.

♂. Nearly allied to the Ceylonese and commoner Indian form *T. sepiaris*, Butler, but with the lower side of the abdomen polished, finely sculptured instead of being coarsely corrugated and rugose.

Total length 32 mm., carapace 12·5.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Genus LABOCHIRUS, Poc.

Labochirus cervinus, sp. n.

♂. Allied to the Ceylonese *L. proboscideus*, Butl., but with the chelæ thinner and longer and scarcely a trace of the large blunt obtusely angular prominence at the base of the hand on the inner side, but with the anterior border of the tibial apophysis produced into an obtusely angular prominence instead of being lightly sinuous as in *L. proboscideus.*

Total length of body 30 mm., carapace 11.

Locality.—Mangalore (*T. Battie*).

Labochirus cervinus, sp. n.

♂. Allied both to *L. proboscideus* and *L. cervinus*, but distinguishable by having the inner border of the hand behind the digit more inflated than in *L. cervinus* and less so than in *L. proboscideus.* Moreover, the posterior border of the tibial apophysis is straight; the anterior border is also straighter than in the other species, not sinuous as in *L. proboscideus* and not inflated as in *L. cervinus*; the extremity of the anterior border convexly rounded.

Total length 28 mm., carapace 11.

Locality.—Kanara (*T. R. D. Bell*).

Order SOLIFUGÆ.

Genus RHAGODES, Poc.

(= *Rhax*, Koch, Simon, Pocock, &c., not *Rhax*, Hermann.)

Rhagodes vittatus, sp. n.

Closely allied to *R. semiflavus*, Poc., but differing in having a broad pale band extending throughout the upper surface of the abdomen and including the last or anal segment. In *R. semiflavus* the pale band only extends over the posterior half of the upper side of the abdomen, and the anal segment is black.

Total length of body and mandibles 30 mm.

Locality.—Karaghora in Kathiawar (*Bombay Nat. Hist. Soc.*).

Order ARANEÆ (Spiders).

Family *THERAPHOSIDÆ.*

Genus SELENOCASMIA, Auss.

Selenocasmia himalayana, sp. n.

Colour.—Carapace covered with yellowish-grey pubescence; abdomen brownish-black, with olive-green pubescence above, blackish below; legs nearly black, with the exception of the patellæ and the upper side of the trocanter and coxæ which are yellowish-grey and the same colour as the carapace.

Total length 35 mm., length of carapace 15.

Locality.—Dehra Dun (*F. Gleadow*).

Genus CHILOBRACHYS, Karsch.

Chilobrachys fimbriatus, sp. n.

Colour of upper side a tolerably uniform yellowish-brown; velvety-black below. *Carapace* as long as patella plus tibia of 1st leg, much longer than those of 4th. *Legs* of first pair considerably longer than of 4th; femora of palpi and of anterior two pairs furnished externally with a thick fringe of hairs.

Total length about 50 mm., carapace 26.

Locality.—Khandalla (*Bombay Nat. Hist. Soc.*).

Genus PŒCILOTHERIA, Sim.

Pœcilotheria rufilata, sp. n.

♂. *Colour* of dorsal side of body and limbs a tolerably uniform greyish-red, only obscurely mottled; sternum, coxæ and trochanter velvety-black; femur of palpi black below in the basal two-thirds of its length, with metallic lustre, paler in the distal third of its length;

patella and tibia yellowish-grey below, and furnished with long red bristles ; femur of 1st and 2nd leg with the anterior surface ornamented with a large yellow patch which occupies nearly the basal half of its length ; the rest of the surface black with metallic blue reflections ; patella yellowish-brown, tibia coloured like femur ; underside of 3rd and 4th legs a tolerably uniform yellowish-brown, clothed like the anterior legs with long greyish or reddish bristles ; lower side of abdomen velvety-black.

Length 32 mm., carapace 17.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Genus HAPLOCLASTUS, Sim.

Haploclastus nilgirinus, sp. n.

At least differing from *H. cervinus*, Sim., according to the description, in being much larger, in having the 4th leg much shorter than the 1st and shorter even than the 2nd.

Total length 52 mm., carapace 24, 1st leg 62, 4th 58.

Locality.—Nilgiri Hills (*Mahon Daly*).

H. cervinus from Kodaikanal has the following dimensions :—Total length 30 mm., carapace 15, 1st leg 39, 4th 38·8.

Genus THRIGMOPŒUS, gen. nov.

Allied to the genus here identified as *Haploclastus* of Simon, but the stridulating area on the mandible, consisting of a large semicircular cluster of many-curved, thickened, but pointed, bristles ; on the maxilla the aciculate bristles below the suture arranged in a curved vertical series on a slightly elevated ridge near the middle of the segment. Protarsi of 3rd and 4th legs adorned apically, with spines both above and below.

Type.—*T. insignis.*

Thrigmopœus insignis, sp. n.

♀. *Colour* blackish, clothed above with yellowish-brown hair and below with velvety-black pubescence. Carapace longer than patella, and tibia of 2nd leg and protarsus and tarsus of 4th equal to patella and tibia of 4th ; fovea large, as wide as the ocular tubercle. *Legs* of medium length, 2nd about twice-and-a-half times the length of the carapace ; 1st leg longer than 4th.

Total length 55 mm., carapace 27, 1st leg 76, 4th 73.

Locality.—Kanara Ghats (*Bombay Nat. Hist. Soc.*).

Thrigmopœus truculentus, sp. n.

Smaller and paler in colour than the preceding species; carapace lower; fovea smaller, less than width of ocular tubercle; length of carapace less than patella plus tibia and than protarsus plus tarsus of 4th leg. *Legs* longer, 1st nearly three-and-a-half times as long as the carapace, 2nd about three times as long.

Total length 40 mm., carapace 19, 1st leg 65, 4th 62.

Locality.—Karwar (*Bombay Nat. Hist. Soc.*).

Genus PHLOGIODES, gen. nov.

Thoracic fovea deep and strongly procurved; eyes of anterior line a little procurved. *Legs* strong, tibiæ unspined; protarsi of 1st and 2nd spined at apex, and of 3rd and 4th with superior spines as well. Tarsal scopula of 1st, 2nd and 3rd pairs undivided, of 4th narrowly divided in male. Posterior sternal sigilla large and remote from the margin. No tibial spur on anterior leg of male.

Type.—P. validus.

Phlogiodes validus, sp. n.

♂. *Colour.*—Carapace covered with a thick coating of silky yellowish hairs; femora of legs covered above with golden-brown hairs, the rest of the appendages with hoary-grey hairs contrasting strongly with the ruddy tint of the femora; upper side of abdomen covered with long rich golden-brown hairs. *Carapace* with cephalic region low and narrow; shorter than patella plus tibia of 1st and 4th legs. *Legs* 4, 1, 2, 3 in length, long and strong, with stout femora; 4th a little less than four times as long as carapace. Bulb of palpal organ but little inflated; spine broad and spatulate at base, pointed at its distal end.

Total length 25mm., carapace 12·2, 1st leg 41, 4th leg 46.

Locality.—Matheran (*Bombay Nat. Hist. Soc.*).

Phlogiodes robustus, sp. n.

♀. Too strikingly different from the foregoing to be regarded as the female of the same species. *Carapace* and limbs scantily clothed with short, greyish-red hairs; abdomen blackish above. Carapace long, almost as long as the patella plus tibia plus $\frac{1}{2}$ protarsus and to tibia plus protarsus plus tarsus of 1st leg; cephalic region high. *Legs* short and thick; patella of 1st as long as its tibia and longer than its protarsus: protarsal scopula of 2nd divided by broad band of setæ; no protarsal pad on 3rd ; tarsal pads of 2nd, 3rd and 4th divided by a very broad band of setæ and present only at the sides of the segments.

Total length 27 mm., carapace 13, 1st leg 29, 4th 33.

Locality.—Matheran (*Bombay Nat. Hist. Soc.*).

Genus Plesiophrictus, gen. nov.

Thoracic fovea transverse, straight ; eyes of anterior line slightly procurved. Sternal sigilla marginal. Legs spined, a few on the anterior tibiæ and protarsi ; many on the posterior pairs ; protarsal scopulæ scanty on 1st, 2nd, and 3rd legs, absent on 4th ; tarsal scopulæ of 3rd and 4th divided by band of setæ. Tibia of anterior leg armed with a strong inferior spur and a smaller tuberculiform spur above it on the inner side.

Type.—*P. millardi.*

Plesiophrictus millardi, sp. n.

Colour of carapace and legs a tolerably uniform mouse-brown, except those clothing the upperside of the protarsus of the 1st leg, which are snow-white. *Carapace* about as long as patella plus tibia of 1st and of 4th legs. *Legs* 4, 1, 2, 3 in length, 4th a little longer than 1st, tibia of 1st incrassate distally. Spine of palpal organ broad at base, filiform apically and spirally twisted.

Total length 12 mm., carapace 6.

Locality.—Matheran (*W. S. Millard*).

Plesiophrictus tenuipes, sp. n.

♀. *Colour* as in the foregoing, but anterior protarsi not white above. *Carapace* slightly less in length than patella plus tibia of 4th, and slightly exceeding those of 1st ; its width about equal to protarsus of 4th. *Legs* 4, 1, 2 and 3 in length, 4th much longer than 1st and scarcely thinner, nearly three times as long as carapace.

Total length 16 mm., carapace 7, 1st leg 16, 4th 20.

Locality.—Kandy in Ceylon (*Col. Yerbury*).

Plesiophrictus collinus, sp. n.

♀. Resembling *P. tenuipes* in colour, but differing in the proportionate length and strength of the legs, the 1st leg being considerably stouter than the 4th and only a little shorter than it ; the 2nd considerably longer than the 3rd, and the 4th less than twice-and-a-half times as long as the carapace.

Total length 18 mm., carapace 8·5, 1st leg 19, 4th 20.

Locality.—Yercaud in the Shevaroy Hills (*J. R. Henderson*).

Family CTENIYIDÆ.

Genus ACANTHODON.

Acanthodon opifex, sp. n.

Nearly allied to *A. crassus*, Sim., but darker in colour, the head, palpi and front legs being deep fuscous, and no red tint observable upon the appendages. Area of carapace behind ocular tubercle more elevated than in *A. crassus;* but with the median ocular tubercle flat along the top, not higher in front than behind as in A. *crassus;* anterior laterals more prominent than in the latter species.

Total length 20 mm., carapace 10.

Locality.—Bombay (*H. M. Phipson*).

The only known specimen of this species was received alive in its trap-door nest.

Family ERESIDÆ.

Genus STEGODYPHUS, Sim.

Stegodyphus mirandus, sp. n.

♀. *Colour.*—Carapace, mandible, palpi, legs and mouth-parts black, clothed with olive-black hairs; sternum with narrow dark border and marked with two parallel bands of yellowish-grey hairs; abdomen testaceous, clothed with yellowish hairs; spinners and anal tubercle black.

Total length 20 mm., carapace 8.

♂. *Colour.*—Abdomen black; tibia, protarsus and tarsus of 1st leg and the whole of the 2nd, 3rd and 4th legs bright red, the coxa and trochanters alone being blackish-brown.

Total length 12 mm, carapace 6.

Locality.—Bombay (*Bombay Nat. Hist. Soc.*).

Family PSECHRIDÆ.

Genus FECENIA, Thor.

Fecenia travancoria, sp. n.

Closely related to the Burmese species *F. cylindrata*, Thorell, but with the eyes more widely spaced, those of the posterior line being straight or slightly procurved. Depression of vulva completely divided by a high longitudinal keel, the posterior border deeply and angularly emarginate. (In *F. cylindrata* the depression of the vulva is undivided.)

Total length 13 mm., carapace 5·3.

Locality.—Madatory in Travancore (*H. Ferguson*).

First record of the genus *Fecenia* from India.

Genus PSECHRUS, Thor.

Psechrus alticeps, sp. n.

♀. Easily recognisable from the Ceylon species *P. torvus*, by having the cephalic region of the carapace narrower, more sharply defined and much higher, and the anterior line of eyes much more strongly procurved. The legs are also much longer.

Total length 15 mm., carapace 6·5, 1st leg 49.

Locality.—Ponmudi in Travancore (*H. Ferguson*).

First record of genus *Psechrus* from India.

Family HERSILIIDÆ.

Genus TAMA, Sim.

Tama variata, sp. n.

♀. *Colour.*—Carapace brown in middle, blacker at sides, clothed with grey and black hairs; pale mark on head, red hairs about the eyes, edge of clypeus testaceous, clothed with white hairs; upper side of abdomen blackish, variegated. Posterior border of vulva produced into a median convex lobe. ♂. Smaller than ♀, with patella and tibia of palp unmodified; tibia twice as long as patella.

Total length (♀) 10 mm., (♂) 6.

Locality.—Kandy (*E. E. Green*).

Family LYCOSIDÆ.

Genus LYCOSA, Latr.

Lycosa phipsoni, sp. n.

Allied to the Burmese species *L. nigrotibialis*, Sim., but with stouter legs and a little differently coloured, the femora of the legs being scarcely paler than the coxæ and without an apical fuscous band beneath. Moreover, in the female the carapace is longer than the patella and tibia of the 4th leg, and in the male the carapace is equal to the protarsus of the 4th.

Total length ♀ 20 mm., carapace 10. Total length of ♂ 19 mm., carapace 10.

Locality.—Bombay (*H. M. Phipson*).

Lycosa wroughtoni, sp. n.

♂. Closely allied to the Ceylonese and Indian species *L. indugatrix*, Walck., in having the mandible clothed in front with red hairs and in general colour and structure, but differing in the darker colour of the anterior femora, the absence of a median white band on the anterior tibiæ, and in having the red coating of hairs upon the front of the mandible not extending to the extremity of the segment.

Total length 25 mm., carapace 8·5.

Locality.—Bulsar in Guzerat (*R. C. Wroughton*).

Genus Hippasa.

Hippasa pantherina, sp. n.

♀. Coloured much as in the other species of the genus; differing from *H. olivana* and *H. agalenoides* in having the carapace as long as the 4th protarsus and longer than the patella and tibia of the 3rd leg, and in possessing a third fringe of long hairs on each side of the lower surface of the abdomen. In ♂ the carapace is as long as the patella and tibia of the 3rd, and longer than the tibia of the 1st.

Total length ♀ 16 mm., carapace 7·8. Total length of ♂ 15 mm.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Family HETEROPODIDÆ.

Genus Sparassus.

Sparassus phipsoni, sp. n.

♂. Larger than *S. lamarckii* and *S. wroughtoni*, and in general coloration approaching the latter; but the mandibles black, and the tibiæ of the legs furnished with a basal dark patch which extends on to the patellæ. Palpus much resembling that of *S. lamarckii*, but with the inner side of the tibial apophysis lightly concave, and the process on the tarsus shorter and less claw-like.

Total length 19 mm.

Locality.—Bombay (*H. M. Phipson*).

Genus Heteropoda, Lat.

Heteropoda kandiana, sp. n.

♀. Much darker in colour than is *H. venatoria*, the clypeal band narrow and arched, the lower half of the clypeas black. *Carapace* less than length of 3rd tibia, and less than half length of patella and tibia of 2nd leg; eyes of anterior line more strongly procurved than in *H. venatoria*, the medians only a little more than half the diameter of the laterals. Legs longer, the 2nd about five-and-a-half times the length of the carapace, the 4th as long as the 1st. *Vulva*, with its lateral lobes separated by a broad linguiform process.

Total length 24 mm., carapace 11.

Locality.—Kandy in Ceylon (*Col. Yerbury*).

Genus PANDERCETES, L. Koch.

Pandercetes decipiens, sp. n.

Coloured above so as to match the lichen-covered bark of trees, greyish and mottled with brown ; sides of legs strongly tufted with hairs ; coxa, maxilla, labium and sternum shining black; femora of 1st and 2nd legs orange-yellow below.

Total length 16 mm., carapace 7.

Locality.—Punduloya in Ceylon (*E. E. Green*).

Pandercetes celatus, sp. n.

♀. Dorsal surface covered with hairs of a greyish tint, forming whitish plumes on the sides of the legs, as in *P. decipiens* ; but the undersides of the femora of the anterior two pairs of legs a rich blackish-brown, tinged with bronze, the underside of the tibiæ of the 3rd and 4th legs similarly coloured.

Total length about 22 mm., carapace 8.

Locality.—Trivandrum in Travancore (*H. Ferguson*).

Genus STASINA.

Stasina nigropiata, sp. n.

♂. Closely allied to *S. nalandica*, Karsch, but differing at least in the form of the tibial apophysis of the palp, which is large, long and blade-like, and furnished with an inferior lobate expansion. In *S. nalandica* the apophysis is thick, and has its apex produced inwards into a sharp tooth.

Total length 9·5 mm., carapace 4-5.

Locality.—Punduloya in Ceylon (*E. E. Green*).

Family PLATORIDÆ.

Genus PLATOR, Sim.

Plator ixodinus, sp. n.

♀. Resembling *P. indicus*, Simon, from Poona, in having a narrow black line bordering the carapace, and a longitudinal black stripe running down the posterior legs, but differing essentially in the disposition of the eyes of the anterior line, which in *P. indicus* are said to be almost in contact, whereas in *P. ixodinus* they are separated by a very appreciable distance.

Total length 10 mm.

Locality.—Konain, 7,800 ft., and Mundali, 8,000 ft., in the Himalayas (*F. Gleadow*).

REVIEW.

* THE GAME BIRDS OF INDIA.—PART II.

Knowledge so extensive and accurate as Mr. Oates's knowledge of Indian ornithology often unfits a man for the work of helping beginners and smatterers, but " The Game Birds of India " shows that Mr. Oates can be popular as well as scientific. It is in almost every respect a model of what a popular *vade mecum* should be. Technical terms and technical matter alike are absent, and even those detailed descriptions which are apt to be more irksome than helpful to the ordinary reader are successfully dispensed with. In dealing with the Ducks and Geese, which take up more than four-fifths of this volume, Mr. Oates has first divided them into certain groups, such as True Geese, True Ducks, Pochards, indicating a few external characters by which each group may be distinguished ; and then he has headed the account of each species with a brief note of those features in which it differs from all the others of its group. In the Introduction, he states that the primary character of importance among the waterfowl is undoubtedly the pattern of colour presented by the primaries. Unless the point of this remark is the play upon the word " Primary," it is unfortunately expressed. Whether the quill feathers of a bird are black, or grey, or a little of both, is only a primary character by way of a pun. Intrinsically it can scarcely be a character of any importance at all. But it chances, in the case of the Ducks and Geese, to be a very useful mark of distinction, as insignificant features often are, and Mr. Oates has made much use of it. Whether his signs will prove infallible in the working can only be decided by practical experience, for the proverb that the proof of a pudding is in the eating of it, applies to nothing more than to books on natural history. But much confidence may be placed in so accurate a naturalist as Mr. Oates. And when the sportsman has by these simple methods identified his bird, he will not only have got a name for it, but he will know almost everything that is known about it. This is the most attractive feature of the book. A surprising amount of information about each species has been gathered together from many sources. We learn in what parts of India it has been found, when it comes and when it goes, how it behaves itself here, what it eats and how it quacks and how it flies ; then we follow it to its home in Spain, or Norway, or England, or the arctic regions, and learn all about the manner in which it makes its nest and brings up its young. Altogether 37 species of Swans and Geese and Ducks are described. Three species, namely, the Whooper and Bewick's Swans and the Bean Goose, which are included in Hume and Marshall's book, are left out here, the evidence for their occurrence in India being doubtful. Short notices are added of the species which the author considers not unlikely to wander into India from neighbouring regions, a wise provision which will help sportsmen to keep on the look-out. The Woodcock and five species of Snipes follow, and the book closes with an appendix describing two species of Pheasants which have been found within Indian limits for the first time, since Part I was published.

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* " A Manual of the Game Birds of India." Part II. By E. W. Oates. A. J. Combridge & Co., Bombay, 1899.

Where so much is excellent it is unpleasant to find fault, but there is what we cannot help characterising as an inexcusable fault in this book, and it springs from Mr. Oates's unbridled originality. He has attained a position in his subject which entitles him to be original and his views will always command respect ; but there is a time and a place for everything, and a little reflection ought surely to have convinced him that this book did not offer a suitable occasion for innovation. It is not addressed to specialists in ornithology, but to intelligent sportsmen who like to identify the birds they shoot. Those who wish to do more than this are recommended by Mr. Oates himself, in the Introduction, to study Dr. Blanford's volume in "The Fauna of British India." Then how did he fail to see the propriety of sinking his personal opinions and following the nomenclature and arrangement adopted by Dr. Blanford, whose book, whether we agree with it in all points or not, must, for years to come, be the text book of all ornithologists in India ? Of the forty-three species in this little volume, no less than ten appear under names different from those given to them in "The Fauna of British India." Even the trivial English names to which we have all got accustomed are changed to suit Mr. Oates's personal notions. The Mallard is the Wild Duck, the Whistling Teal the Small Whistling Duck, and so on. But the worst example is the Spotted-billed Duck, which is put by Blanford, as by all previous writers, into the *genus Anas,* with the Mallard. Mr. Oates separates it altogether, brackets it with Hume's Oceanic Teal (which he calls The Andaman Duck) and invents a new *genus* for the accommodation of these two. But in his group of True Ducks he includes, with the Mallard, such dissimilar birds as the common Teal, the Pintail and even the Shoveller.

MISCELLANEOUS NOTES.

No. I.—NOTE ON *DIACAMMA*, A PONERINE GENUS OF ANTS, AND OF THE FINDING OF A FEMALE OF *D. VAGANS*, SMITH.

Of the hunting ants, *Poneridæ,* belonging to the genus *Diacamma,* Mayr, I am personally acquainted with only two species in Burma, *D. vagans,* Smith, and *D. scalpratum,* Smith. The former is smaller and less common than the latter, and so far as my experience goes, has the entrance to its nest-tunnels under a stone or fallen log, while the latter species makes its nests boldly in the open, like many of the *Camponotidæ.* It is curious to note what a difference there is between the outside look of the entrance of a nest of *D. scalpratum,* and of that of some species of *Camponotus. C. rufoglaucus,* for instance, carries out the earth-debris of its nest and piles it so close to the entrance that half its time is taken up in clearing out stuff that has tumbled back into the nest. Not so with *D. scalpratum,* a self-possessed and very clever ant, whose nests can be distinguished at a glance. The grains of earth dug out and carried to the surface are always thrown well away from the entrance to the nest. There is one curious point of resemblance, however, between the nests of *Camponotus* and the nests of *Diacamma.* The earth-debris when carried out is always piled to one side of the nest, never round it, as in the nests of some of the *Pheidole.*

If you push a twig into the entrance to the nest of *D. scalpratum,* a commotion ensues, the workers swarm out in numbers, jaws open, and stings ready, but there is no haste and no rushing about in a vulgar flurry as is seen when a nest of *Camponotus* is disturbed. Leave the twig in and the nearest *D. scalpratum* will seize it in her jaws, and after trying to sting it, will tug and tug till she either drags or carries it out, when it is taken to the rubbish heap and chucked down with every look of disgust and scorn. I once weighed a ♀ of *D. scalpratum* and the little piece of stick it had carried out of its nest and calculated that, had I proportionate strength and dexterity, I ought to be able to walk off with a three-ton teak log. What a very useful Forest officer I would be under such circumstances. *Diacamma* ♀ has been for years a desideratum to Myrmecologists. It makes me sad to think of the many nests I have ruined, the hours of hard labour I have spent, and the language that I have used in the futile search for ♀ *Diacamma.* I had given up all hope of finding her when I chanced on two taking a walk. It happened in this wise. On the 19th June, 1898, I was inspecting the boundaries of a Forest reserve in the Taungoo district. I was passing over a cleared fire trace when my attention was attracted by a number of *D. vagans,* which were quartering the ground in a rather more hurried and aimless way than is usual with that very self-possessed species. The nest seemed to be under one end of a felled tree which had evidently been cut down in clearing the fire-trace. Imagine my delight when, as I stood watching, I observed a winged ant larger than any of the workers creeping out from underneath the fallen tree. Close to her were three or four of the workers following with every demonstration of vigilance. On my seizing the ♀ with my forceps, two of the workers gave battle, holding on to and stinging the forceps with all their might. I had to bottle them along with the ♀. I then had the log turned over. There were swarms of workers, but not another winged specimen, nor any pupæ, nor eggs. I searched and searched but could find no more, and was just going on when I caught sight of another ♀ walking all by herself fully ten feet from the nest. I bottled her promptly and then a few more of the workers.

♀ *Diacamma* closely resembles the ☿, but apart from the fact of being winged, it is larger and heavier with a broader mesothorax, and a larger abdomen. The striations are similar, but as in *Odontoponera* ♀ compared with *Odontoponera* ☿ the scutellum is larger and more developed and longitudinally striated.

Diacamma ♀ L. 14 mm.

Do. ☿ L. 11 mm.

C. T. BINGHAM, Colonel.

MANDALAY, 5*th June*, 1899.

No. II.—A "RARE" BAT—AN APPEAL.

Mr. T. B. Fry recently sent me a pair of bats shot by him on the Belgaum-Kanara boundary (Lat. 15. 30′ N., Long. 74. 40′ E). I can distinguish them in no way from *Vespertilio pachyotis*, Dobson—*Vesperugo pachyotis*, No. 177 of Blanford's "Mammals."

This species was founded on a pair obtained in the Khasi Hills of Assam (Lat. 25 to 26-N., Long. 91 to 92-E.) nearly 30 years ago, since which its existence has not again been recorded.

Two years ago I shot a bat in the Surat District which was identified by Mr. Thomas of the British Museum as *Pipistrellus dormeri*, Dobson (*Nycticejus dormeri*, No. 193 of Blanford). Mr. Thomas wrote of it in this Journal as "this rare bat," while Blanford records only three known specimens; yet, later on, I was able to obtain any number of specimens, and found it to be quite one of the commonest local bats.

I think these examples show how little is known of the distribution of our bats, and emboldens me to ask members all over the country to shoot and send in bats, which I shall be happy to do my best to identify for the Society.

The British Museum is badly in want of skins and skulls of bats, and I shall be delighted to explain to any one willing to take up this work how the skins should be "made up."

There are, however, many members who have no taste or leisure for such work, but who could easily spare an hour about sunset occasionally to shoot a few bats. To such I appeal to do so, and to put them in spirits and send them to me for the Society or to the Society direct.

The only precaution required is to force open the mouth of the specimen to its widest extent with a piece of cork before dropping it into spirits so that it may stiffen with the mouth wide open and so facilitate the examination of the dentition. The locality and approximate date should be recorded.

There is no necessity to send heavy jars or bottles. When the specimens have been thoroughly soaked in spirit, they may be taken out and packed in cotton wool damped with spirits and will take no harm in the two or three days necessary for transit.

All bats will be welcome, but it is especially the smallest of which least is known. They usually fly immediately after sunset.

R. C. WROUGHTON.

POONA, 19*th May*, 1899.

No. III.—FOOD OF *PERNIS CRISTATUS* (CUV.), (THE CRESTED HONEY-BUZZARD.)

A friend of mine in this district, a keen ornithologist, sends me the following interesting communication :—" I saw a *Pernis cristatus* devouring an oriole (*melanocephalus*) on May 14th." Blanford, in his 3rd Vol. of Birds, writing about the food of this species, states that it is also said to feed on " the eggs and young of small birds." My correspondent also mentions, " that of course the oriole might have been newly fledged, but there was no mistaking either species."

CHAS. M. INGLIS.

MADHUBANI, TIRHUT, 19*th June*, 1899.

No. IV.—BIRDS OF THE KYAUKSE DISTRICT.

I send you a list of certain birds obtained in the Kyauksé District, Upper Burma, between January, 1898 and April, 1899. This district lies between 22° 15′ and 22° 45′ N. and 95° 55′ and 96° 15′ E., and is well watered, irrigated, and highly cultivated, except in the extreme West and South. The reasons for my drawing attention to these birds will be seen from the " remarks."

The numbers refer to the " Fauna of British India (Birds)."

J. H. SEWELL, MAJOR.

RANGOON, *June*, 1899.

No.	Name.	Remarks.
22	Hooded racket-tailed Magpie ...	Not noted as occurring so far North of Thayetmyo. Local name is " Nă upá gyee."
106	White-throated Babbler......	Very common. Not noted as occurring East of the Irrawaddy.
117	Tweedale's Scimitar Babbler ...	Not noted as found in Upper Burma. Nesting in November and several seen later.
261	Spotted Wing	Not noted as occurring between Manipur and Pegu. Common in January and February.
306	Blanford's Bulbul	Lateral limit not defined. Very common.
502	Jerdon's Minivet	Not noted as occurring North of Pegu. One specimen obtained in February.
515	Burmese black-naped Oriole......	Not noted as occurring between Manipur and Pegu. The specimen obtained was in length as No. 518, and yellow in the tail as in No. 514, as given in the " Fauna of India." Burmese name " Să nwin wà "
579	Verditer Flycatcher	These were the only two kinds.
601	Indian black-naped Flycatcher.	
781	Pegu House Sparrow	Common about March. Noted as occurring at Mingun near Mandalay.
818	Wire-tailed Swallow	I think I saw 2 of these in March of this year. The lower plumage was absolutely white.
895	Purple Sun-bird	Commonly called " Nán pyi sôt."
935	Green-breasted Pitta	One bird obtained. Not recorded between Manipur and Pegu.
948	Little Scaly-bellied Woodpecker	Fairly common. Not noted as occurring in Upper Burma.
1091	Night Jar	Burmese name "Myay Wöt." This is given in " Fauna" Vol. IV, as the name of the Fantail Snipe !
1152	Barn Owl	I had a good opportunity of watching this bird. A nest of 6 young birds was in an old Mango tree, easily accessible, and the birds were visible from the ground. The parent birds remained by day in a tree close by, and came out to feed the young at dusk, one sitting on the watch while the other went for food. The young birds flew away one by one, as they grew up.
1180	Spotted Owlet	Common. Noted by Oates as "probably occurring throughout the drier parts of Burma."
1187	Brown Hawk Owl	Burmese name " Mén young."
1404	Purple Moorhen	Burmese name " May nyo."
1484	Snipe—Fantail	Local name—" Pazim bon."
1485	Snipe—Pintail.........................	The earliest date I saw one was 19th August and the latest date 28th April. They are recorded from Mandalay in May.
1488	Painted Snipe	Local name " Pazimbon kya" (or já).
1543	Davison's Ibis	Reported from the Irrawaddy. They are also common on and near the Chindwin River.
1583	Barred-headed Goose	
1593	Spotted bill Duck	
1602	Shoveller	
1555	Common Heron	Nests in cotton trees in the Kyauksé district. I have seen 30 nests in one tree.
1571	Yellow Bittern........................	Burmese name " Hmaw taw."
1574	The Bittern	I shot one on 22nd April. Was not this late for the bird to be so far South ?

No.	Name.	Remarks.
1113 1114	Cuckoos	These birds are common in Kyauksé district. Do they use the same note as the English bird? I thought I heard it once, but it sounding very faint. The Burmese do not seem to know the ordinary "Cuc-koo". note.
1418	Stone Curlew	Burmese name "Kway-hkawyit."
1584	Comb Duck	Blanford gives the Burmese name as "Tanbai." I have always heard it called in Upper Burma "Hmauk-tin."

No. V.—NOTES ON THE *HYPOCOLIUS AMPELINUS* (THE BULBUL SHRIKE).

Since Dr. Bowdler Sharpe's paper in the "Ibis,"—1886, page 476,—"On the Birds from Fao," nothing has been written about the *Hypocolius*, and Mr. Oates in his "Avifauna of India," page 250, states: "The position of the present genus is somewhat uncertain owing to want of information regarding the plumage of the nestling;" this information is supplied in the following notes.

These notes being a record of the breeding seasons of this little-known bird, necessarily repeat themselves, but those of one year go to confirm those of another, and as all the information we can get referring to the *Hypocolius* is valuable, I have not attempted to condense them.

The adolescent stage of plumage has never before been described. The descriptions given were taken from living specimens—nestlings and immature—and are correct for each individual bird to which it refers.

The measurements where given are from freshly killed birds before skinning.

Von Henglin, in his "Ornithologie Nordost-Afrika's" describes an adult bird of the second year, while Mr. Blanford had before him a bird of the first year, the dusky markings on the primaries being a sign of immaturity. In nestlings—a fortnight to three weeks old, the first primary is almost entirely sooty, all the others being graded with the same, gradually decreasing towards the secondaries, till the last primary is only broadly tipped with it. By the time the birds leave Fao, this has worn off all the primaries except the first two, where it is confined only to their tips, as in Mr. Blanford's bird.

The nestlings take after the female in coloration except that the white patch in the male is always present. In the immature female the secondaries are tipped white, as is also the half-grown feather of the adult, this disappears as the feathers grow to full size. The barring, so characteristic of the nestling and immature *Laniidœ*, is *never* present.

In the breeding season the plumage of the male is decidedly brighter than at any other time. The bill is flesh-coloured with blackish tip in immature and adult alike, except in the breeding season, when it is black in the adult. The legs, feet and claws are flesh-colour. Mr. Oates' description in his Avifauna, page 251, is evidently from the dried skin.

A young male I reared began to show the black on the head in the second month, those at the base of the culmen first appearing, later a few odd black feathers appeared under the eye and ear coverts; it was quite three months old before the circle round the head was completed.

These birds arrive in Bushire in March, occasionally they are to be seen towards the end of the same month in Fao, but usually in April.

They breed in June and July, nests have been rarely taken towards the end of May. The male assists the female in building the nest and sitting on the eggs.

The nest is completed in three to four days; one egg is laid daily till the full number is completed, *i.e.*, four to five, and about fourteen days are taken in incubating.

The female has only the one call; the male has a different call, but very often imitates the female, especially when alarmed; he has also the habit of erecting the feathers on the head, similar to *Otocompsa leucotis*, when excited.

The call of these birds is a very pleasing liquid note, nothing like the harsh cry of the Shrikes. They are more arboreal, at least in Fao, than the last-named. They live chiefly on fruit, but also indulge in a little insect diet, as several stomachs I have examined contained legs and wings of beetles, &c. They appear to hunt for their food among the trees, not descending to the ground, nor taking insects on the wing as is usual with the Shrikes.

They become very tame if reared from the nest, but are difficult to bring up, requiring constant care and attention. Those that I have reared were fed with fruits, bread—chowpatti—steeped in water slightly sweetened with sugar or in milk slightly sweetened, flies and cockroaches, and now and again a little raw meat chopped finely. They were fond of picking at wet clay, not sand, which they eat evidently as a digestive.

15th June, 1886.—Morning.—One nest with four fresh eggs marked down. Male seated on nest.

16th June, 1886.—Morning.—Two nests marked down to west of Telegraph buildings, one contained three fresh eggs, the other two young just hatched and one egg highly incubated.

Evening.—Visited nest marked down on 15th, the female was seated on nest, while male was on watch close at hand. I tried to catch the female on the nest, she flew off and got pinned through the carpal joint, by a date thorn and was secured alive. Also visited nests marked down this morning, male was seated on nest with the young ones, while the female was seated on the other.

17th June, 1886.—Evening.—Nest containing three eggs yesterday, had four this evening, the female was seated on them when we approached. The nest which had the young ones was found empty, the strong wind that had been blowing all day had caused them to fall out. One young one was found dead transfixed by date thorn, the others had evidently been carried off by the crabs that abound everywhere in Fao.

18th June, 1886.—One nest being built was seen to-day.

20th June, 1886.—Morning.—Found a freshly completed nest, no birds observed anywhere near. Further on came across a second empty nest, but on ground underneath were the remains of four fresh eggs, evidently blown out by the breeze. Returning homewards visited first nest found this morning ; it now contained one egg.

21st June, 1886.—Morning.—Nest of 18th found completed but empty. Three others were marked down, two being built, the third containing four eggs on which male was seated. Nest of 20th contained two eggs.

22nd June, 1886.—Nest of 20th contained three eggs. Set nooses on nest found yesterday which contained four eggs and noosed male, did not remove nest or eggs hoping to noose female.

23rd June, 1886.—Nest of 18th completed on 21st contained one egg. Removed nest and eggs of 21st as female had deserted it.

24th June, 1886.—Morning.—Nest of 18th contained two eggs, one nest of 21st which was being built was found completed and contained one egg.

Evening.—Nest marked down on 20th contained four eggs.

26th June, 1886.—Morning.—Found one nest under construction. Nest of 21st which was completed on 24th and contained one egg, contained four this morning. The one of the 18th had also four eggs.

27th June, 1886.—Evening.—One nest containing four eggs found.

28th June, 1886.—Nest of 18th contained five eggs to-day. This number is seldom found.

30th June, 1886.—Nest of 21st removed by Arab lads.

1st July, 1886.—One empty nest found.

2nd July, 1886.—Two found destroyed by Arab lads.

20th July, 1886.—Morning.—Five nests marked down. The first contained two young just fledged. Second was an old, empty nest. Third was a new one, empty. Fourth and fifth were under construction.

21st July, 1886.—One young bird fully fledged found dead in date tree, a second well able to fly was seen.

22nd to 31st July, 1886.—Young birds of season with parent birds observed in small flights in fields at back of date plantations.

30th March, 1891.—Two males and one female shot by my collector. Six were seen. Each bird shot weighed 2oz. Length of male 10·4″ × 13. Female—Length 10″ × 13″.

31st May, 1891.—One nest containing three highly incubated eggs found. Female seated on nest, which was about 5 feet from ground.

2nd June, 1891.—Marked down one nest being built.

3rd June, 1891.—Came across one nest being built, both birds at work, watched them for some time with my binoculars.

4th June, 1891.—Nest of 31st destroyed by Arab lads.

7th June, 1891.—Three nests found, one contained two eggs, the second three, and third one egg. Females seated on each. Nest of 3rd June contained three eggs, nest of 4th contained four.

10th June, 1891.—Two of the three nests found on 7th contained four eggs each.

19th June, 1891.—A nest with four young marked down. They had a little down of soiled white colour on their heads, the sheaths of the feathers were just showing. Further on came across a second nest just begun.

21st June, 1891.—Last mentioned nest completed.

3rd June, 1891.—Above nest contained one egg.

28th June, 1891.—Nest containing four eggs found. I removed them as one was marked with the zone at the smaller end, the other three were marked as usual. Unfortunately they were highly incubated and broke whilst blowing.

N.B.—All nests found since 19th were built near pathway, that of 21st overhung main roadway.

8th August, 1891.—One young female brought to me to-day fully fledged. Forehead isabelline; ear-coverts light brown; a dark spot in front of eyes; chin and throat light isabelline; gape yellowish-white; nape slightly lighter in shade than crown; remainder upper parts reddish-isabelline.

29th August, 1891.—Young male brought to me to-day, black spot in front of eyes. Forehead isabelline: rictal bristles minute and black.

8th September, 1891.—One adult female noosed, a young male fully fledged brought to me.

12th September, 1891.—Adults with birds of season in small flights in fields at back of date gardens.

7th June, 1892.—One nest containing four fresh eggs, and another with three young—eyes not opened—brought to me by my collector, who said he took them from an Arab lad.

29th May, 1896.—My collector reported having seen one nest to-day containing 3 eggs.

30th May, 1896.—Visited nest of yesterday, it contained four eggs. It was placed on date leaf about 6ft. from ground and close to pathway.

31st May, 1896.—Nest found to-day containing two young ones, sheaths of feathers just appearing. A little white down on heads. Nest placed in centre of small date bush about 3 feet from ground near the bund at back of date gardens.

11th July, 1896.—Came across a nest containing two young birds, their feathers just appearing from sheaths, wing feathers more developed than any of the others, a little down still adhering to tips, especially on the head. The grey sheaths give birds a greyish-isabelline appearance. The isabelline on the forehead shows plainly, under-parts soiled white. Primaries, secondaries dark grey-brown, white wing patch conspicuous in male. Secondaries in female not tipped white. Bill and legs light bluish (?) flesh.

15th July, 1896.—One nest found with one very young bird.

27th March, 1897.—*Bushire.* A pair of *Hypocolius ampelinus* seen to-day on Konar (*Zizyphus jujuba*) bush in the Telegraph garden.

14th April, 1897.—*Bushire.* Mr. E. Isaacson shot a male bird in his garden.

28th June, 1897.—*Fao.* First nest seen to-day, had two half-fledged nestlings.

2nd July, 1897.—*Fao.* Two young, about a fortnight old, taken from another nest for rearing.

5th July, 1897.—An Arab lad brought me two young birds to-day.

16th July, 1897.—The young ones of 3rd died suddenly.

18th July, 1897.—Female of the two taken on 2nd died this morning.

25th July, 1897.—Male of 2nd doing well. The following is a description of it :—

Head, neck, mantle, back, light grey-isabelline, forehead and ear-coverts purer isabelline. Primaries and coverts black, terminal third of primaries white, *each* tipped sooty, the first three more broadly than the others ; this gradually wears away as birds grow older. Secondaries ashy on outer web, black on inner, under-parts soiled white ; a narrow nude circle round each eye bluish ; rictal bristles black. Eyes dark brown. Beak, both mandibles fleshy with horn-brown tip ; gape white, legs, feet, claws, fleshy. Tail, only about 1½ inches have burst from their sheaths and this is black.

27th July, 1897.—One young female well fledged brought to me to-day by an Arab lad, who took it from a nest three days ago.

4th August, 1897.—Male of 25th and female of 27th doing well. The forehead and ear-coverts of female are of light isabelline colour, wings grey-drab, but there is a lighter patch shewing across primaries corresponding to the white in wing of male.

27th September, 1897.—Both above birds shewing signs of moult. Top of head of male is a light isabelline throughout. I have shot immature males in this phase of plumage, and the Tring Museum has a skin or two. It may be a sign of a weakly bird as mine appears to droop frequently, and does not pick up till allowed to fly about the garden each day for a few hours. The black circle round head is shewing in patches, the change from isabelline to grey in the male is caused by the wearing away of the feathers, especially on mantle and back, and not by shedding them.

11th November, 1897.—Black circle is now complete, entire top of head is grey, the isabelline is confined to very narrow streak at base of bill.

1898.—The above two were brought alive to Karachi, and were kept together in a large cage. In the hopes of getting them to breed, I placed twigs and straw in the cage, the female as the breeding season commenced, began to pick these up in her bill and carry them about the cage apparently desirous to build, but unfortunately the male was accidentally killed. The female I sent to the Bombay Natural History Society in whose charge I trust it is still living.

In 1890 I presented a male of this species to the London Zoological Society it died in 1894 or 1895. The opportunity to study the anatomy of these birds was no doubt taken advantage of, the information thus obtained together with my notes, will, I hope, lead to their correct position being determined.

W. D. CUMMING, C.M.Z.S.

KARACHI, 20*th June*, 1899.

No. VI.—TWO UNUSUAL SPECIMENS OF *TROPIDONOTUS STOLATUS.*

A specimen of the above was brought to me on 15th April, 1899, killed in a crevice of rock, where it was lying basking outside Chakdara fort. It is singular in having only 7 labials, the 3rd and 4th entering the eye on one side, and 8 on the other, with 4th and 5th entering the eye. In addition it has 4 postoculars on the right side, 3 on the left, and I have just got another specimen in Rangoon, 15th June, 1899, with 4 postoculars on the left side and 3 on the right.

F. WALL, CAPT., I.M.S.

RANGOON, 22*nd June*, 1899.

No. VII.—DURATION OF PARTURITION IN THE DABOIA.

(*Vipera russellii.*)

Yesterday there was brought to me a female Daboia, which measured 4 ft. 6 inches, which for this part of India is large.

As the snake was of great girth, I opened her and took out 63 young ones. Some of these, though quite perfect and fully coloured, were still coiled in egg shape, and surrounded by a *very* thin membrane or the remains of it; others were absolutely at liberty, and I cannot help thinking that if the snake had been brought to me as soon as she was killed, instead of four hours after, a number of the young ones would have emerged alive. I measured five or six of them taken at haphazard; the longest was 10 inches and the smallest 9 inches. What I want to ask is this, whether, in the case of viviparous snakes, all the young ones, amounting in this instance to between 60 and 70, are born at one time, or whether, having regard to the fact that a large number of them were clear of the egg membrane, while others were not, the maturer young come out an appreciable time, say 24 hours, before their immaturer brethren.

Is it possible that some of the young might have emerged even before the snake was killed ?

E. C. CHOLMONDELEY.

INDORE, 1*st July*, 1899.

The point raised by Mr. Cholmondeley is an interesting one, as very little appears to be known regarding the duration of parturition. Some years ago a Daboia, kept in one of the glass cases in our museum, gave birth to a number of young ones, and I remember that on the following days several others were born, but the actual time over which parturition extended was unfortunately not recorded.

EDITOR.

No. VIII.—OCCURRENCE OF THE GREEN-BILLED SHEAR-WATER (*Puffinus chlororhyncus*) ON THE MEKRAN COAST.

A specimen of the Green-billed Shear-water (*Puffinus chlororhyncus*) was shot last month (May) at Ormara on the Mekran coast, about 125 miles west of Karachi, and as I am not aware that this bird has been noted from these parts before, it may be of interest to record its occurrence.

In the dried skin, which has been sent to me, the bill is dusky-brown ; middle and inner toe and inner side of tarsus light drab ; outer toe and outer side of tarsus dark brown.

The bird is a sooty colour throughout, very dark on the upper parts from the base of the bill to the tail inclusive, the latter is nearly black ; underparts more ashy, gradually darkening towards under tail coverts ; chin greyish ; wings, sooty brown above, light colour underneath.

Length—from dried skin—14·5″ ; wing 10·4″ ; bill, front 1·25,″ gape 1·75″; tarsus 1·75″ ; middle and outer toe including claws 2·4″ each ; inner toe and claw 1·9″ ; tail about 4″ from vent.

W. D. CUMMING, C.M.Z.S.

KARACHI, *July*, 1899.

No. IX.—NOTES ON A VERY UNUSUAL SPECIMEN OF *SIMOTES VIOLACEUS* OR A POSSIBLE NEW SPECIES.

This snake is one of five specimens given to me by Vety.-Capt. F. H. Evans, A.V.D.

They were all killed whilst clearing a patch of grass where he intended camping at Minglegon near Rangoon. Of these, two turned out to be *S. cruentatus* and two *S. violaceus.* Capt. Evans tells me there were several other specimens killed at the same time which being mutilated were not worth keeping.

Spirit specimen—

Length—1'-6$\frac{7}{8}$", tail 2$\frac{1}{8}$".

Scales—mid-body, 17, smooth.

Ventrals—(169) rounded in front, angulate behind.

Anal—single.

Subcaudals—(31) double.

Rostral—breadth same as height.

Internasals—suture nearly as long as prefrontal.

Frontal—distinctly longer than distance to end of snout. Equal parietals.

Nasals—divided.

Loreal—single, longer than high.

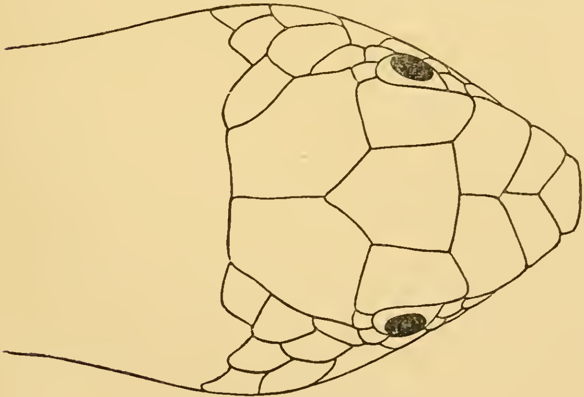
Preocular—2 R., 3 L., upper not reaching crown.

Temporals—2 and 2.

Labials—7 (3 and 4 enter the eye). 3-7 deep, subequal.

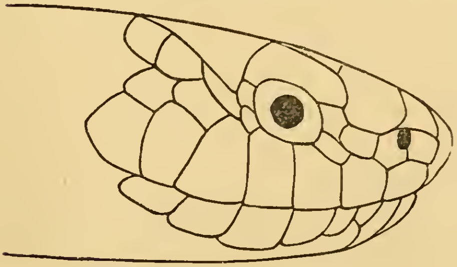
Anterior chin shields—larger than posterior, contact with four lower labials.

Colour—olive-brown above, a few scales irregularly outlined darker.—Dark chevron-shaped collar directed forwards, and broad streak from parietals to behind gape. Preocular transverse streak continued through eyes to become a subocular between 4th and 5th labials. Belly yellowish, with large, irregularly outlined, plumbeous, spots scarce in front, more numerous behind.



(*Simotes violaceus* × 4.)

Beneath tail uniform yellowish-white. No spots.



(*Simotes violaceus* × 4.)

Remarks.—It seems singular that so many snakes were found so close together at the same time. This specimen differs from an ordinary *S. violaceus* in the following ways :—

(1) Frontal being decidedly longer than distance to end of snout.
(2) 7 labials (3rd and 4th entering eye).
(3) 2 anterior temporals.
(4) 31 subcaudals.

It is also remarkable in having 3 preoculars on the left side.

F. WALL, Capt., I.M.S.

Rangoon, *7th July*, 1899.

No. X.—[*] PROTECTIVE POWERS OF SCENT IN ANIMALS.

I regret that my endeavours to solve the difficulty that Mr. Eardley Wilmot is labouring under have not been successful. I shall now offer another solution, namely, that the difficulty has arisen solely out of Mr. Eardley Wilmot's own imagination, and that his premises are not based on solid proof. I am not by any means satisfied that deer, admitting that they can smell, do not notice, *i.e.*, wind, a man in a tree, that a man can smell a tiger or that a tiger cannot smell a man. Mr. Eardley Wilmot assumes that all these are facts, and then complains that his assumptions have landed him in a difficulty which is insoluble. I think, too, he has somewhat lost sight of the topic which we are discussing, it is not whether animals have powers of scent, but whether animals have developed powers of scent as a means of protection against their enemies and use them as such. No doubt most animals can smell, but what impression does smell convey to their minds, does it cause them pleasure, awaken their curiosity or create alarm. It is only the latter impression that we have to deal with. Mr. Eardley Wilmot's cow buffalo apparently felt no alarm at scenting the tiger's tracks, so that, admitting that she was following up the track, the incident does not help us. So far from protecting her, the power of scent might have led her into the tiger's jaws. No doubt buffaloes are very useful in following up a wounded tiger, but then they are driven towards where the tiger is supposed to be lying up so as to prevent a sudden charge in long grass, and I have seen them pass a tiger which had been dead some hours and was a little high, without showing the slightest emotion of any kind. However, this is really a digression, and it is necessary again to bear in mind the distinction between winding and scenting. I am open to conviction, but I am not aware of any game animal in this country which has developed protective powers of scenting. I mean that the instinct of an animal that can scent a track is generally to follow it, if this instinct is absent, whatever impression is conveyed by the track is one of curiosity. It is therefore off the point in discussing our subject to talk about tigers tracking, but does Mr. Eardley Wilmot seriously believe that a tiger which has left a kill in the early morning and retired into the hill several miles away to lie up for the day, scents out its early morning track when returning to the kill probably at least twelve hours after? Granting that an animal can scent its own track, scent in this country is proverbially bad, and especially so in the hot weather. As soon as the sun gets powerful and the dew is off the ground, hounds can do nothing, and even at the bloodhound trials which were held last year in England, the hounds were let loose as soon as the hunted object had reached the sanctuary. A tiger does not wander about the jungles in an aimless sort of way, without knowing where it is or where it is going. A tiger knows the particular track of country which it frequents as well as a man knows his native town, and will find its way back to a kill as easily as a man finds his way to his club. Returning to the main point, what proof have we that sambhur would wind a man standing behind a tree but not a man sitting in a tree. Mr. Eardley Wilmot seems to think that a mere assertion on his part that this is so, is sufficient proof, but I certainly should not jump to this conclusion without a very exhaustive series of experiments. If at a sambhur drive the guns are placed in trees, it is to escape being seen just as much as to escape being winded, as it is far more difficult than one thinks for a man to conceal himself behind a tree, especially if he wants to keep an eye on what is coming. The slightest excrescence of an unusual nature will excite suspicion. As a matter of fact I fancy most deer drives would be arranged to be made down wind, and if there are deer in a beat for tiger they are too distracted by the shouts of the beaters to think of anything else but flight in the opposite direction. I confess to feeling rather sceptical about a man being able to smell a tiger, at any rate at a sufficient distance for practical purposes. I once winded one a considerable way off, but it happened to have died three days before, and cannot, therefore, be taken into account. I have never yet heard of a man being warned by his nose that a tiger was in the beat, but even admitting that a man can smell a tiger, it does not follow from that that a tiger can smell a man, at any rate at a sufficient distance to warn him of danger. The question really to be solved, is, at what distance is an animal's sense of smell effective so as to afford it protection. Supposing that a tiger can smell a man at twenty paces, that is not much use to it if it is knocked over at thirty.

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[*] Notes on this subject will be found in Vol. XI, pages 314, 526 and 745.—Editor.

N. C. MACLEOD.

BOMBAY, *July*, 1899.

No. XI.—CANNIBALISM.

The other day I was accidentally enabled to throw some light on the process by which the exuberant population of youthful toads, now so conspicuous, is kept within limits. I happened to see a toad about as big as one's thumb looking in that attitude of rapt attention which characterizes a batrachian about to feed, at a very tiny member of his own species which had climbed a little way up a gate-post and was resting there. Expecting some interesting development, I waited, and ere long saw another minute toadling, which I had not noticed before, make one hop close by the bigger toad, and then disappear completely. Suspecting foul play in this sudden evanishment, I incontinently captured, killed, and dissected the presumed swallower, and extracted the tiny one from his interior, somewhat faint indeed, but quite alive and active enough after a wash. Of course, he had only been swallowed a very few minutes. Whether he would have been digested is another matter, for a toad is insufferable food to many animals, and has been seen to be ejected by a frog. But very likely a toad's stomach is more tolerant of its own kin, and, if that be so, the decrease in the number of youthful specimens of *Bufo melanostictus*, as the season wears on, is largely accounted for. House-lizards also are known to devour the young of their species, and probably cannibalism is far more common than is usually suspected. The proverbs "Dog won't eat dog" and "Hawks don't pick out each other's eyes" imply a popular belief to the contrary; but if we allow that the devouring by one species of a near ally is cannibalism they are totally unfounded; for the peregrine falcon frequently preys on the Kestrel, and the wolf on dogs and foxes, while, here in Calcutta, the late Edward Blyth established the reputation of the India Vampire (*Megaderma lyra*) as a blood-sucker by finding one in the act of extracting the vital fluid from a smaller bat which it was carrying as it flew, and afterwards devoured when placed in a cage with it. Indeed, cases of cannibalism more or less flagrant are quite common among wild animals, and not unnaturally occur still oftener in captivity.

F. FINN.

CALCUTTA, *July*, 1899.

(The above appeared in the *Asian* on 18th July, 1899).

No. XII.—FOOD OF THE INDIAN WILD BOAR.

Much has been written on the subject of the food of the Indian Wild Boar, but I have recently come across a fact, which may be worth recording, showing what extraordinary activity these heavy animals are capable of when in search of highly appreciated food. I recently visited some friends at Jelwaree (?), and found that all the apple trees on the estate, including those close to the house, had the lower branches broken off to a height of about 5′ 6″ from the ground, and it was evident from the foot-prints that the mischief had been done by pigs and not bears.

R. M. NASH.

GARHWAL, *July*, 1899.

No. XIII.—TAPEWORMS FOUND IN A FISH.

Some time ago Major R. H. Rattray forwarded to this Society a species of Tapeworm which he had found in a small fish (*Aspiuoparia morax*) which is known in the Punjab as the Chilwa. The parasite appears to be *Ligula* *implicissima,* and its presence in a fish is curious, as none of the authorities mention the fact that tapeworms occur in Indian fishes. As this genus is however frequently found in birds, I presume that the fish must have swallowed the ova expelled from some water-bird.

In England and other European countries those who eat the whiting and the bream are not infested with the worm *Ligula.* In fact there is no case on record in which the *Ligula* was ever known to have attacked man. Probably the gastric juice in the human stomach is strong enough to digest the ova. In India, therefore, those who get the Chilwa for the table need not be afraid of being infested with the parasitic worm *Ligula.*

R. M. DIXON.

BOMBAY, *August,* 1899.

No. XIV.—THE COMMON INDIAN SWIFT.

The Common Indian Swift (*Cypselus affinis*), No. 1073, Blfd., taking possession of RED-RUMPED SWALLOW'S (*Hirundo erythropygia,* 823.) Blfd., nest whilst occupied by the latter.

I am no ornithologist, I am sorry to say, and so am not sure that I am giving these birds their correct names, but that they are not of the same species, habits, and appearance I am certain ; and I give the circumstances in connection with them, as they seem to me to be sufficiently unusual and interesting.

In the spring of 1897 a pair of Red-rumped Swallows—or what I take to be these birds—(they are in their ways, general appearance, note and song, close connections of the Wire-tailed Swallow, but very much more soberly coloured)—came and built their half-gourd shaped *mud* nest at the upper end of one of the rafters of my verandah and reared several broods in it, that year and the next. This spring they again took up their residence in it, and had been occupying it for about a week or so when a pair of the Common Indian Swifts appeared. I believe they are the Common Indian Swifts, as they build their nests in the same situations as the above-mentioned Swallows *but entirely of feathers,* instead of mud, and are noisy and dirty birds about their nests, neither of which the Swallows are. For these reasons I have not allowed the Swifts to build in my verandah for some years past, though until last spring they have persistently returned and endeavoured to do so. The Swifts came back again this year, and one evening whilst I was sitting in this verandah, some half-a-dozen yards from the Swallow's nest, one of the Swifts suddenly darted into the Swallows' nest, and was followed by the other one. The Swallows were in the nest at the time and after a few piteous cries they flew out, leaving the Swifts in possession. The Swallows returned the next day, and for a day or two afterwards tried, at intervals, to repossess themselves of their nest, but without success, for the Swifts have remained in possession and have brought up one or more broods of young in it The Swallows have built themselves another nest in a building some 200 yards removed from this. I was curious to know if the Swallows had left any eggs in the nest when dispossessed of it, and whether the Swifts had hatched them, but I could not see into the nest, owing to its position, without breaking it open; nor did I see any broken eggs thrown out under the nest or any young ones about, as I did in the previous two seasons when the Swallows were there.

Is it not curious that a bird should take possession of the nest of another *when occupied*, and more especially that nest of another species, and quite different in material, if not in make, from *its own nest?*

NORMAN F. T. TROUP.

KAUSANIE, KUMAUN, *8th August*, 1899.

No. XV.—THE NIDIFICATION OF SOME MALAYAN BIRDS.

THE THICK-BILLED SPIDER-HUNTER (*Arachnothera crassirostris*, Reichb).—I obtained the eggs of this Spider-hunter on March 17th this year at Kepong, in Selangor. The nest was an oval structure, about 11 inches long and 5½ inches in diameter, sewn to the underside of a large plantain leaf, (*Musa*), and composed entirely of dried plantain fibre. The entrance was at the side against the leaf, which formed part of the back wall of the nest. There were two fresh eggs, beautiful little things, pure white with a broad zone formed by a tangled confusion of the slenderest lines scrawled in a dark blackish-brown pigment, the fantastic and delicate tracery reminding one of the wizard Merlin's book with "the text no bigger than the limbs of fleas."

The eggs measured $\frac{25}{32} \times \frac{9}{16}$ and $\frac{13}{16} \times \frac{19}{32}$.

THE CINNAMON-HEADED GREEN PIGEON (*Osmotreron fulvicollis*, Wagl.).—I took a pair of eggs of this handsome pigeon in Pahang in May. The nidification, which is of course exactly similar to that of other green pigeons of the genus, is not described in Vol. IV of the Birds in the "Fauna of British India," so perhaps it may be worth while to record the dimensions of the eggs. They are rather short and broad, both measuring $1\frac{1}{32} \times \frac{27}{32}$, the shell of the usual *Osmotreron* texture and gloss.

The nest was placed on a low tree in a little sandy island in the Pahang River, on which I landed to try for a jungle-fowl; the male bird flew out of the tree from close to the nest, and I shot him before I noticed it.

THE BURMESE WATTLED LAPWING (*Sarcogrammus atrinuchalis*, Blyth) was breeding along the Pahang River in May, and I obtained two clutches of 4 and 3 eggs, the clutch of three being considerably incubated.

THE BLACK AND RED BROADLILL (*Cymborhynchus macrorhynchus*, Gm.) was also breeding in May, and I took two or three nests with eggs, one of the pieces of material used, in one of them being the entire nest of a small Sun-bird!

THE MALAYAN BEE-EATER (*Merops sumatranus*).—Great quantities of these bee-eaters were breeding along the banks of the Pahang River when I travelled down it in May, large or small nesting colonies being passed all down the two hundred and odd miles of river from Lipis to Kuala Pahang on the East Coast.

The nest-holes are almost always made in flat sandy ground, nests in vertical banks being quite the exception.

The burrows descend at a slant at first, and then run horizontally about 18 inches or 2 feet below the surface. They are of considerable length, the egg chamber often being 7 or 8 feet from the entrance. Clutches generally contain 4 or 5 eggs of the usual *Merops* type.

The flat sandy "padangs," or plains on the East Coast were full of the nest holes of these bee-eaters, from which the brilliantly coloured birds kept flashing out into the sunlight as one approached. Scarcely less numerous than the bee-eaters on these sandy flats were the beautiful sand lizards (*Liolepis belliana*), by which all the old bee-eaters' burrows seemed to be occupied. Very quick and wary they were, basking motionless with the bright blue and orange skin of their sides expanded to the hot sun, but scurrying off with rabbit-like celerity at the approach of danger, and vanishing down the nearest burrow in a little whirlwind of dust.

The half-dozen specimens which I wanted I had to shoot; catching them was out of the question.

Wounded ones when handled expanded the beautifully coloured skin of the sides as much as possible, but seemed very gentle and made no attempt to bite.

SELANGOR, *July*, 1899. A. L. BUTLER.

No. XVI.—BISON, TIGER, AND WILD DOGS.

I can, from personal observation, fully confirm Captain Burton's statement,—as mentioned in his Jungle Notes in the last number of this Journal—that Bison will enter cultivation when near jungle. In a portion of the hill part of the Kanara district there are a number of rice-fields, surrounded by thorny fences with thick forest close up. I have noticed on several occasions, when passing by these fields early in the morning, large gaps in the fences and the rice much trampled over from Bison forcing their way through at night, attracted by the crop. I have followed their tracks from the fields far back into the jungle. The field watcher used to ask me to sit up for a shot; but the nights, while I was staying in the neighbourhood were too dark. The Bison visited the fields late and retired from them in the dusk of dawn.

Bison, mostly cows and young animals, are often killed by tigers in the Kanara forests. Early one morning, during the hot weather, a lady, who was stalking a herd of Bison, saw two tigers engaged in the same operation as herself, but before either party could complete their plan of attack the herd galloped off. I imagine it is only seldom one tiger tackles a big bull, smaller animals in a herd being so much easier to overcome, but two tigers working together would be more than a match for a solitary bull. Captain Burton incidentally mentions that a pack of wild dogs was seen by his shikaries in "full cry" after a panther. Now, as the act of giving tongue by wild dogs when hunting their game has been denied by several very competent naturalists and sportsmen, it is much to be regretted that such a capable observer as Captain Burton was not present when this occurrence took place.

G. S. RODON, Major.

Dharwar, *August*, 1899.

No. XVII.—THE WHISKERED TERN (*HYDROCHELIDON HYBRIDA*).

This time last year I recorded in this Journal having found a breeding haunt of this Tern. Most of the eggs at that time were highly incubated and some had already been hatched off; so this year I sent a man a month earlier to see whether the birds had commenced breeding yet. He returned, having found five nests but without eggs. I sent him again ten days later, but this time he reported no Tern to be seen. I could not understand this, so about the end of the month, happening to be near the place, I visited it myself, but besides a few River Terns (*Sterna seena*) there were no others to be seen. Since then I have had diligent searches made in all the likely nesting resorts, but have failed to find a single nest. What can account for their deserting their breeding places this year? Can the excessive rainfall have anything to do with it?

CHAS. M. INGLIS.

Madhubani, *August*, 1899.

No. XVIII.—AUTUMNAL ARRIVALS.

The following species have already arrived here :—

The Small Indian Pratincole (*Glareola lactea*).—This species is not a resident here, at least not in the north of the district. The first small flock was noticed on the 10th instant.

The Greenshank (*Totanus glottis*).—A solitary bird was seen by me on the 17th of last month, but by the end of the month numbers had arrived.

The Green Sandpiper (*Totanus ochropus*).—A few stray birds were noticed about the middle of last month, a few days earlier than *T. glottis.*

The Pintail Snipe (*Gallinago stenura*).—I flushed my first snipe of the season on the morning of 18th whilst riding through some damp land. There were only two birds, and they probably belonged to this species. Last year the first snipe was seen on the 13th, thus five days earlier than this year's.

As yet no Stints (*Tringa*) have put in an appearance.

This morning a small party of Garganey Teal (*Q. circia*) flew over my head, they had come from the east, and went away westwards. Last year the first arrivals were only noticed on the 5th of September, twelve days later than this year's.

CHAS. M. INGLIS.

MADHUBANI, 25*th August*, 1899.

No. XIX.—NOTE ON THE WHITE-EYED DUCK (*NYROCA FERRUGINEA*) AND THE TUFTED DUCK (*N. FULIGULA*).

On reading an article by Mr. F. Finn, of the Indian Museum, entitled "On a third invasion of India by Baer's Pochard (*Nyroca baeri*)," published in the P. A. S. B. for April, 1898, in which he mentions brown as being the usual colour in the iris of the females of that species, I examined the labels of the few female skins I possess of *N. ferruginea*, and find that I have noted the irides of that species (females) as being dark grey, dark purplish-grey and brown, with one exception, in which it was white. Blanford in Vol. IV, Birds (Fauna of British India series). makes no mention of the iris in the female, whether adult or young, being else than white.

Nyroca fuligula.—On the 17th March a duck of this species was brought me along with some other ducks. It had a fair-sized spot of *pure white* on the throat, otherwise it was as described by Blanford. I may remark that out of over 100 ducks, not including teal, brought me last cold weather, this was the sole specimen of this species procured.

I add a list of the duck and teal brought me last cold weather, all snared on one jheel in the west of the sub-division :—

Gadwall (*C. streperus*)	50
Common Teal (*N. crecca*)...	48
Wigeon (*M. penelope*)	9
Pintail (*D. acuta*)	25
Garganey Teal (*Q. circia*)	100
Shovellers (*S. clypeata*)	10
Red-crested Pochards (*N. rufina*)	7
White-eyes (*N. ferruginea*)	10
Tufted Duck (*N. fuligula*)	1

CHAS. M. INGLIS.

MADHUBANI, *August*, 1899.

No. XX.—A PLAGUE OF WEB-MAKING CATERPILLARS ON THE "SILANG" TREE (*OLEA FRAGRANS*).

Some four or five years ago a horde of white Moths (two of which I am sending to you for identification) came here, and seemingly laid their eggs on the above mentioned trees—and apparently *no others*, though the Silangs are surrounded by Walnuts, Oaks (*Quercus jucana*) and Deodars—and the following spring these were full of hundreds of thousands of a medium-sized somewhat hairy caterpillar, that covered the whole tree with a net-work of very strong web, like that of a spider's, making the tree look as though it were in a mist. They eat off all the leaves and keep them eaten down—till they have killed some of the trees, by such treatment, year after year.

Birds cannot get at them, the web is so plentiful and strong—(some of it when twisted into a strand of, say ⅛″ thick, is too strong to break)—and all my efforts to collect and burn them ; cover the trees with dry pine needles and set fire to them, &c., &c., have been of no use in getting rid of them. Is there anything practicable, that will do so ?

NORMAN F. T. TROUP.

KAUSANIE, KUMAUN, *8th August*, 1899.

NOTE ON THE ABOVE BY G. C. DUDGEON, F.E.S.

The two moths which were sent to me for identification by Mr. Phipson are both females of *Naxa textilis*, Wlk., var *hügeli*, Feld. I should much like to receive specimens of the larva. As far as I can find out, the latter has never been described. The species belongs to an abnormal sub-family of the *Geometridæ* called *Orthostixinæ* which is near the primitive stock of the family. In another sub-family, *Œnochrominæ*, belonging to the same family, a few ancestral forms are said to have larvæ with a tendency to develop additional prolegs and a consequent different mode of progression from the typical one. It would be interesting to know whether the caterpillar here mentioned 'loops' in walking, this being the normal method of progression among larvæ of the family.

Caterpillars can be easily preserved in a bottle of spirits of wine or glycerine, and do not suffer much in transit. To eradicate them, spraying the web with a solution of saltpetre and igniting the same when dry, should effectually reduce their numbers, but it will probably be found that they will not recur in following seasons in such large quantities even if not interfered with, as their parasites will probably increase in like proportion.

G. C. DUDGEON, F.E.S.

Mr. E. H. Aitken published in this Journal a graphic account of a somewhat similar phenomenon observed by him in N. Canara (*vide* Vol. VI, page 489)—[EDITOR].

No. XXI.—NESTING OF THE BLACK EAGLE.

On page 589, in the last number of this Journal Mr. Mahon Daly asks for information on the nesting of the Black Eagle (1210, *Ictinaëtus malayensis*, Blf., Fauna of B. India).

I took the nest of this bird on the 29th April this year, about 10 miles from Murree. It was situated 60 feet from the ground, in a large Hill Oak, the tree being about 100 feet high, growing on a thickly wooded and steep hill slope, between 7,000 and 8,000 feet above sea level. The nest was a large platform, 3 to 4 feet across, consisting of sticks, and was built on a branch where it bifurcated from the main trunk. There was one fresh egg in the nest, which measures 2·5 inches in length and 2·05 inches in breadth. The surface is coarse and rough, and is greyish-white in colour, plentifully speckled and blotched with pale brown and pale mauve. According to Blanford, the Black Eagle has not been observed west of Chamba, but I have seen it more than once in these parts, and in the present instance shot the bird off the nest and identified it. I send the foot of the bird, which is sufficient for identification.

KENNETH BUCHANAN, Captain.

Changla Gali, *August*, 1899.

No. XXII.—FOOD OF THE PALM-SQUIRREL.

When walking in an upper verandah this morning I noticed on an adjacent flat-terraced roof, that was still wet after several hours of quiet rain, a common grey squirrel (*Sciurus palmarum*) eating some kind of small beetles, which surprised me, as I had always understood that squirrels were purely vegetable feeders.

T. W. BARTLETT.

Waltair, Madras Presidency, *August*, 1899.

It is well known that the Palm Squirrel will eat small insects when pressed for food, and it has been seen, by the writer, scratching the red earth off the trunk of a tree and seizing the *Termites* that were underneath.

Editor.

No. XXIII.—NESTING OF THE LARGE-BILLED WILLOW WARBLER (*ACANTHOPNEUSTE MAGNIROSTRIS*).

I beg to record having taken the nest of the above-mentioned bird on the 15th of this month at Changla Gali, about ten miles from Murree, at an elevation of about 8,500 feet.

I send two specimens of the bird and one egg for the Society's collection. The female was shot off the nest, which was a large loosely-made domed structure of moss and maiden-hair stems, lined with fine grass. It was situated under an overhanging bank, on the side of a steep wooded hill, supported by the projecting root of a tree. The nest contained 4 fresh pure white eggs, average length ·72″ and breadth ·51.

KENNETH BUCHANAN, Captain.

Murree Hills, *July*, 1899.

The identification of the bird has been verified by Mr. E. Comber and also Mr. E. C. S. Baker, who describe the find as an important one. The bird has long been known to breed in Kashmir, but the nest has not been found before.

Editor.

No. XXIV.—OCCASIONAL NOTES ON BIRDS' NESTING IN THE NEIGHBOURHOOD OF POONA.

Though probably of no scientific value, a few rough notes on Birds' Nesting round Poona may prove of interest to some, this tempts me to record my experience.

Returning from leave from England in March of the current year, I was posted to this station. As soon as I was comfortably settled in, I began adding to my collection of eggs. Unfortunately the species in this vicinity do not vary, in any great degree, from those I have come across in other places where I have happened to be quartered, still, I have been enabled to more or less complete my collection in some species in which I was weak.

THE YELLOW-THROATED SPARROW (*Gymnorhis flavicola*).—Though this bird breeds freely here, I was only able to add one clutch to my collection. I found many nests, as a rule, tenanted by a family. Holes in trees seem to be the favourite nesting site. They also seem to follow the practice of their genus in Hyderabad, Sinde, and occupy hollow lamp posts. The late Lieutenant Barnes drew attention to this peculiarity.

THE INDIAN BLACK ROBIN (*Thamnobia fulicata*).—The common Robin of Poona, every house in Cantonments having a pair or two in its compound. This bird is not over particular in the selection of a site for its nest, in the eaves of a house, a hole in a bank, on the ground in a hedge, in fact anywhere. The site *par excellence*, however, is an old tin pot or article of similar character; should such exist, especially in some out-of-the-way or secluded spot, it is sure to be seized upon as a home wherein the young Robin can be brought up. There is an old kerosine tin in my compound with a little rubbish at the bottom, in one corner of which these birds built their home. One brood was successfully reared. As soon as it was old enough to shift for itself, the nest was put in order again, and fresh eggs laid. In due course, a second family was hatched but misfortune overtook its members, for one night they disappeared. I hoped they would try a third time, if they did, they selected some other site, for this one was not requisitioned again. I have found several nests in tin pots, which must prove very warm places to raise a family in, especially as the breeding season extends from the end of March to July, the heat, at times, must be terrific. I find these birds very wary, they seem to understand instinctively when you are on the look out for their nests and at once assume a most unconscious air.

THE KING CROW (*Dicrurus ater*).—The only remark I wish to make about this bird is that a pair commenced a nest in my compound towards the end of April: four eggs were laid but only one bird was successfully reared. On the 12th July, I found a second had been built on exactly the same site, and that again only one youngster had been raised.

The Bay-backed Shrike (*Lanius vittatus*).—Very common here, found many nests mostly in May. One pair of these birds selected a most public site for their nest at the junctions of Elphinstone and Lothian Roads on a milk burh overhanging the public way, constantly occupied by carriages and people, passing to and fro. I watched the nest but it came to an untimely end; after the bird had been sitting some little while, the road was pulled up for repairs, when I presume some coolie did for it.

THE COMMON PIED BUSH CHAT (*Pratincola caprata*).—I first noticed this bird, early in May, at Karad, in the South of the Satara District, where I found it breeding. I discovered a pair building for the second time, although the first brood was still with them. The nest was situated on the banks of the Yenna-Krishna, on the ground among some prickly pear. I obtained two fresh eggs from it a few days afterwards. Since then I have noticed this bird in Poona, so it probably breeds here. I shall keep a watch on it next year.

THE MAGPIE ROBIN (*Copsychus saularis*).—Is very plentiful. I found several nests mostly in May and June. It is not very particular in its choice of site, any hole either in tree, wall, house, bank, etc., suiting it. I found one nest in the hole of a loose box, where the poles, for keeping a horse in are inserted, it contained 5 eggs. Another nest was built in the iron chimney of an ordinary stove for warming a room or conservatory. This was in May, so probably no fire was lighted while the operation of raising a family was in process, otherwise it could hardly have proved a pleasant home.

THE WHITE-BROWED FANTAIL FLYCATCHER, (*Rhipidura albifrontata*), is very common here. I have come across a few pairs, and have observed them nesting in June and July. I obtained no eggs as the nests were invariably destroyed on or before completion by some unknown marauder.

THE WHITE-SPOTTED FANTAIL FLYCATCHER (*Rhipidura pectoralis*) is the common Fantail Flycatcher, and may be seen where thickets and jungle exist. I have found numerous nests,—in fact, I could not enumerate the number, but have only obtained a few clutches of eggs. The number of nests that are destroyed or deserted prior to completion is simply marvellous. This, I think, is attributable to their fussy habits, one cannot help finding a nest during building operations, they court attention by their fussy proceedings; however, they seem gifted with the utmost cheerfulness and energy, for no sooner is one nest destroyed than a second is promptly started.

THE PURPLE-RUMPED SUN-BIRD (*Arachnechthra zeylonica*).—The common Sun-bird in these parts. They begin to breed in June, when numberless nests can be found. A pair selected a curious site, no other than one of the wires used in opening and shutting a window in one of the Bund Garden Ferneries. There was absolutely no attempt at concealment, the nest being visible to every one who entered. Needless to say it was destroyed.

THE INDIAN GREY TIT (*Parus atriceps*).—Although this bird is very common here, I have been most unsuccessful in obtaining its eggs. On the 20th June I saw a pair building in a hole in a babul tree. I gave them 10 days law and then proceeded to inspect it. My shikari climbed the tree and commenced opening up the hole, he told me the bird was on the nest. However, when she flew off I found it was a Brahminy Mynah (*Temenuchus pagodarum*) which had ousted these little birds and taken possession. On the 26th June, I found a nest in a Casuarina tree about 8 feet from the ground. As the bird was on the nest, I cut it open and was disappointed to find only one egg. Early in July, I saw one of these birds flying off with some material. I followed it into a Babul tree but before I came up, the bird had been into its nest and flew away as I arrived: though I waited and watched, the bird never returned. I visited the tree on several occasions after this, but never saw the birds anywhere near. Being convinced that there must be a nest somewhere, on the 12th July I climbed the tree and searched but no sign of a nest could I see; I however persevered and finally came on a natural hole, on looking into which I saw a nest containing 5 eggs. Next day I climbed the tree again, when I found the hen bird at home and cut open the nest. I had the greatest difficulty in getting her off the nest, she sat so close, in fact was quite covered by the debris found from the chips. Though I have watched very carefully I have not succeeded in obtaining another nest. They seem very wary birds. Since writing the above I have seen many birds followed by a flock of young ones. Next year I shall pay them much attention.

TICKELL'S FLY-CATCHER (*Cyornis tickelli*).—I do not think the nest of this bird has been taken in Poona, though Mr. Davidson found it breeding at Nasils. It is not surprising, therefore, that I should have had the luck to obtain a nest here. In May, I began watching two pairs, one in the Empress Gardens and the other along the banks of the canal. The former pair disappeared, but I spent many an hour watching the latter, for I knew that if they did not migrate they must breed where they were. I was rewarded for my patience. On the 7th July, I visited their haunt to see what they were up to, sure enough I saw the hen building. I watched her and in due time the nest was betrayed. Being afraid lest she should desert, I did not approach but took my departure. On the 16th July, having given her what I considered sufficient time, I again visited the spot in trepidation and was relieved to see the hen slip off as I approached. It contained 4 beautifully fresh eggs of a cream or *café au lait* colour. I then proceeded to take the nest. For those who are unable to see the nest, I will endeavour to describe it, and must ask my readers to pardon my shortcomings. It was about 3 or 4ft. from the ground placed in what I term "parasitic bamboo" that is a sort of bunch of bamboo leaves and twigs; the bamboo branch, instead of growing as usual, seems to throw out a lot of small twigs and shoots, which form a dense mass, the nest was wedged into the bottom of all this and so well assimilated to its surroundings that it looked a portion of the mass. It consisted of dead leaves, twigs, roots, etc., in which a lot of earth was incorporated; the interior is lined with fine twigs and roots, the whole being firmly wedged into the site. Had I not seen the nest building, I certainly should never have discovered it. During the breeding season the cock keeps up a continual concert, his notes are very pretty and low. I hope to get another nest or two next year.

THE CLIFF SWALLOW (*Hirundo flavicola*).—I am very much interested in a colony of these birds, which are building under a low bridge over the river, the arches of which are only some 4 or 5 feet above water level ; in case of flood they must be submerged ; as these birds are building now, I conclude we shall have no more heavy rains, instinct would teach them to postpone their operations otherwise. The nests are attached to the down stream side of 3 or 4 arches and must number several hundred. It is wonderful to watch their methodical ways. They all come out the *up* stream side of the arches, fly low over the water to a spot some 200 yards or more distant, collect pellets of mud for their houses, and return but fly at least 10 or 12 feet above the water and all enter on the *down* stream side of the arches. Those birds, whose nests are sufficiently far advanced, go to another spot to collect straw and feathers, but they observe the same rule of the road regarding entrance and exit to the arches and their flittings to and from them. Talk of regulating traffic in Town after this !

THE INDIAN RED MUNIA (*Sporæginthus amandava*).—This favourite little cage bird, more commonly known as the Amandavat, is said to be rare in the Dekhan. I was therefore very pleased at coming across a colony of them at the beginning of the month along the banks of the river. Previous to this I had never seen them in a wild state. They have taken up their abode among some coarse rank grass, from 3 to 4 feet high, growing in thick tussocks. As the males were resplendent in bridal costume, I knew they must be breeding, so watched them. Before long two couple betrayed their nests by building. About a week after I visited them and found one contained one egg and the other three, out of the latter I took two, in the hopes that more may be laid and also to guard against the whole not being destroyed. The eggs are the most diminutive little things, measuring roughly ·52 × 42. The nests are of the usual *Munia* type, that is carefully built and domed with a small entrance on one side. They are composed of coarse grass lined with finer grass, feathers and flowering grasses, situated in the above mentioned grass tussocks from 2 to 3 feet from the ground and very well concealed. So far as I have observed, the male does the nest building. Although there are some 20 odd pairs in the small patch of grass, I have only noticed two pairs building. I intend going out and searching the whole place thoroughly with a view to obtaining several nests, if these are not already made, the birds must soon commence, as they are all in breeding plumage. The males keep up a continual low song, pleasant to the ear. The eggs are of the usual white colour of the *Munia* tribe.

I think I have written quite enough for the present, so will close my paper. Should I obtain sufficient material, I may be tempted to write more on another occasion.

R. M. BETHAM, Capt.,
8th Bombay Infantry.

Poona, *4th Sept.* 1899.

No. XXV.—WINTER SLEEP OF BEARS.

With reference to Mr. Donald's note on the hibernation of brown and black bears in the last number of the Journal, it is to be regretted that he omitted to state whether his informant from Kulu was a European or a native ; and also whether he went quite close up to the brown bear, which he noticed in a hollow tree. If the bear was in a real state of hibernation it could have been touched without any danger of its awaking, for in true hibernation the body is quite cold—rigid—and with but slight sign of respiration. Of course all hill bears may be found asleep in hollow trees during the day at all times of the year, but whether they truly hibernate has yet, I think, to be proved. This special state I believe must greatly depend on the exact amount of fat they put on during the autumn, and much more on these circumstances than on the elevation they may find themselves as winter sets in. I have shot a brown bear in late autumn with but little fat on his body, and before the heavy snow commenced to fall it would have been scarcely possible for him to have accumulated enough for real hibernation during some four months. Black Himalayan bears have frequently been seen and shot in mid-winter by Europeans ; and the hill people of Chamba have told me that black bears usually come down to the lower valleys as winter approaches. but occasionally they have also been noticed prowling about the high situated valleys in January, sometimes breaking their way into houses in search of grain. I believe hill bears eat a great deal of soft dead wood, and this would be procurable in the upper forests for the bears during the winter months. The brown bear of Russia does not truly hibernate during the winter, although the cold is intense and the whole country is deep in snow. The bears remain often for a long time sleeping in brushwood shelters, from which they move out now and then in search of food. While dozing in the shelter very little noise disturbs them ; on the other hand the black bear of North America can scarcely be roused from his torpid condition during winter, which points to a true state of hibernation in his case.

G. S. RODON, Major.

Dharwar, *4th September*, 1899.

No. XXVI.—POSSIBLE OCCURRENCE OF THE GREAT SNIPE (*GALLINAGO MAJOR*) NEAR MADRAS.

On the evening of the 5th instant, a local shikari brought in four snipes for sale, one of these was a large bird, more than twice the size of the others (*G. stenura*). I considered it to be *G. solitaria* after a hasty examination, length

12 inches, wing just 6 inches, weight a little over 8 oz. ; as I had only a few minutes to spare, I put the snipe away for a fuller examination on the morrow. The first thing the next morning I had my bird out, but, alas ! it was in a high state of putrefaction, so I deemed it necessary to send it off at once to the Superintendent of the Museum here for preservation.

Before doing so, I consulted the books I possessed on the subject (Blanford, Jerdon, LeMessurier, Sharpe, Oates, Saunders, Yarrell and Seebohm), and found my bird was not *G. nemoricola*, *G. solitaria* or a giant *G. cœlestis.*

I came to the conclusion thus : The lateral tail feathers were not attenuated or stiff, hence *G. nemoricola* and *G. solitaria* were excluded. The lateral tail feathers were soft, nearly as broad as the others, white, crossed with two or three bars on the outer webs only near the base, thus excluding *G. cœlestis*, which has these feathers chestnut-buff with subterminal dark brown bars. The wing coverts of my snipe had conspicuous white tips.

From the above characteristics, arrived at by a process of exclusion, I consider I am justified in verifying my bird as *Gallinago major.*

I sent the snipe to the Museum. and had a reply from Mr. Thurston, the Superintendent, to the effect that the bird was *G. nemoricola* ; but this I am positive it was not. I have shot a dozen *G. nemoricola* and had my first specimen identified by Oates, who subsequently obtained the verification of his diagnosis from Bowdler Sharpe. Unfortunately, I have never met *G. solitaria*, and have rather a hazy idea of *G. major*, two or three specimens of which I procured in Ireland now 10 or 12 years ago. The other Indian *Scolopacidæ* I am familiarly acquainted with. Mr. Thurston threw away my bird as being too far gone for preserving, hence the occurrence of *G. major* near Madras must remain in doubt to my unspeakable regret.

Oates in his recently published booklet " The Game Birds of India," Part 2, page 467, says :—" Allied to the common snipe is the Great or Double snipe (*Gallinago major*), which is not unlikely to be found to occur within our limits as a chance visitor :" and as this snipe's distribution is said to be " as far east as the Yenesei (where it exceeds the common snipe in numbers) and southwards to the Tianshan Range " (Saunder's Manual) its very casual occurrence here is possible.

C. DONOVAN, CAPTAIN, I. M. S.,
Member, British Ornithologists' Union.

MADRAS, *7th September*, 1899.

No. XXVII.—LIVE FROGS IN A SNAKE.

A few days ago a large rat-snake (*Zamenis mucosus*), about 6 ft. long, was killed in my compound. I saw it just after it had been killed, and seeing that it had had a feed, I cut it open to see what it had been eating. On opening it I found a large frog about 4 or 5 inches long in its stomach, which at first appeared to be dead, but after about two minutes in the air it began to move, and in about ten minutes it was sufficiently recovered to hop away. Meanwhile the snake had been lying on the ground and a second smaller frog crawled out and hopped away, apparently none the worse for its temporary living interment. The frogs were taken from the body of the snake about two feet behind the head, so I fancy they must have been some little time inside the snake.

H. J. KELSALL, Capt., R. A.

Rangoon, *September*, 1899.

No. XXVIII.—PLUMAGE OF THE SNAKE-BIRD (*PLOTUS MELANOGASTER*).

Mr. E. C. Stuart Baker, in Vol. XII, page 503 of our Journal, says that "no author seems to have noticed the peculiar wavy appearance of the scapulars and inner secondaries" of *Plotus melanogaster*. It is certainly very odd that Jerdon only notices this appearance on the tail-feathers, and Blanford (apparently) on tail-feathers and tertiaries. But, if Mr. Baker will refer to Vol. I, page 113 of this Journal, he will find notice of the same appearance in the scapulars; which alone are in question there. So, amongst hands, the record is complete to that of the next compiler.

Mr. Baker's remark that the "crinkled" appearance "is very conspicuous in newly-moulted birds" agrees with my own observation. I cannot, however, say anything about the breeding season; as I have never been able to observe this bird breeding. The moult is so complete as often to disable the bird from flight for many days. This period is passed upon some deep water with good perches easily accessible. After it the (probably) nuptial plumage grows apace; and I have noticed that the "crinkled" appearance seems to reproduce the fold of the webs in their sheaths, before these burst and fall off, or are preened away.

W. F. SINCLAIR,
Late I. C. S.

No. XXIX.—THE EFFECTS OF A BITE FROM A PHOORSA (*ECHIS CARINATA.*)

By to-day's dâk I send you a small snake in spirits of wine, which I believe to be an *Echis carinata*; the length, when alive, having been about 14 inches. As I have just recovered from a bite from this same snake it may interest you and the readers of the Society's Journal to hear some of the details which, summed up, go to prove that the bite of an *Echis carinata*, if taken in time, can be confidently dealt with.

On the morning of 21st I was trollying along the line, when I saw and tried to capture the above-named snake, which, however, inflicted a bite just above the left hand thumb nail. I at once sucked out what blood and poison I could, but having only a large and blunt shikar knife I was unable to incise the bitten part. However, after trollying back home, 6 miles, I was met by the Doctor, to whom I had telegraphed, and he opened the place in a scientific manner and allowed it to bleed freely for some time. The swelling of the arm set in almost immediately after the bite, and with corresponding pain running up to the armpit. Bleeding, with downward rubbing, reduced this and gave great relief.

On reaching the bungalow shortly afterwards, I at once lay down and then commenced a long and very trying vomiting of large quantities of blood, which lasted, with intervals of about two hours until 3 a.m. the next morning, keeping me awake all night with accompanying fever. This was stopped by injecting ergotine hypodermically in the right arm, and from that time, although I experienced one more vomit (without blood), I began to recover and was able to sit up next day and carry on office work, although feeling very weak from the effect of the vomiting. During the time I was prostrate ammonia and other drugs were administered by the Doctor with more or less effect.

R. H. HEATH, A.M.I.C.E.

RUTLAM STATE, 24*th Sept.*, 1899.

The specimen above referred to was duly received and turned out to be an undoubted Phoorsa (*Echis carinata*).

H. M. PHIPSON, HON. SEC.

No. XXX.—THE BOMBAY LAND *MOLLUSCA*.

I have to add to the list of Bombay Land *Mollusca*, published in the Society's Journal, Vol. XI, page 131, a shell by name *Stenogyra octona* (Chemnitz). This is a shell of somewhat the same character as *S. gracilis* (Hutton) described in that paper, but is larger (nearly an inch in length), and more cylindrical in shape and more blunted at the apex. It can also be distinguished from *S. gracilis* by the absence of an umbilicus.

Mr. Fulton of Kew, to whom I sent the shell for identification, says it is a very widespread species. There are specimens from Ceylon in the Society's collection.

Neither Mr. Phipson nor myself have ever collected it here till this season, when we both obtained it in some quantities. The specimens I found were nearly all in flower pots and on a peculiar sort of garden mould.

Is it possible that it has only recently been introduced with some plant or with some sort of mould from elsewhere? Such methods of dispersal of land shells are well known.

A. J. PEILE, CAPT., R.A.

BOMBAY, 27*th Sept.*, 1899.

No. XXXI.—AN OVOVIVIPAROUS SNAIL.

The following note of an ovoviviparous pulmonate Mollusc may be of interest, as it raises some curious questions. This snail is a *Glessula* from Mahableshwar, which I could not identify in the British Museum, but which may be *G. arthuri*, Benson.

My attention was first drawn to it in May, when I found some dead specimens containing young shells. I found, about the same time, some live specimens sealed up with a chalky epiphragm. These I killed in June before they had been roused by the monsoon, and the oviducts were full of young shells. The young, therefore, appear to develope during the æstivation of the parent.

Do the young find their first food in the body of the parent when they are awakened by the monsoon?

Empty shells of *Glessula chessoni*, Benson, another Mahableshwar species, were found before the commencement of the monsoon, containing eggs. I regret that I did not keep these to see whether the eggs were alive.

It is curious that two similar species in the same place should adopt such different means of propogation.

A. J. PEILE, CAPT., R.A.

BOMBAY, *Sept.*, 1899.

No. XXXII.—*HARPYIOCEPHALUS TUBINARIS* (SCULLY).

The Society has received from Col. Fulton, 1st Ghurkas, a specimen in spirits, of a most interesting bat. The specimen has the peculiarly long thumb and strong claw, tubular nostrils, and other characters of the genus *Harpyiocephalus*. The specific characters agree generally with those recorded by Blanford (No. 198) for *H. tubinaris*. This agreement is specially marked in the details of the shape of the ear and tragus, so that there can be little doubt that the specimen is *H. tubinaris*, Scully.

The only specimen hitherto recorded was obtained by Dr. J. Scully at Gilgit, and described by him in 1881. Col. Fulton took this specimen at Dharmsala (6,000 feet), Punjab.

Our specimen is considerably larger than the type. Translating the measurements of the latter, as given in inches by Blanford, into millimetres, the two compare as follows :—

	Type Specimen.	Dharmsala Specimen.
Head and body...	45	52
Tail	35	42
Forearm	35	45

The sex of the type is not given by Blanford ; our specimen is an adult (even aged) male, and the upper incisors, especially the outer ones, are much worn.

The colour is much as given by Blanford who, however, does not mention the wings. In our specimen the wing membrane is black except (and the exception comprises at least half of the total membrane area) next to the body, within a line drawn from the thumb to the ankle, and narrow lines along the fingers; these areas are a pale rufous. The interfemoral membrane is similarly pale rufous. The hair on the proximal part of the interfemoral membrane is distinctly rufous.

I would take this opportunity to ask members sending in spirit specimens of bats to gag each specimen (with the jaws as wide open as possible) with a piece of cork before putting it into spirits, and to take special care that every part of the specimen is immersed in the spirit; neglect of this latter precaution results almost certainly in the spoiling of the specimen, for the hair on the portion which floated above the surface of the spirit comes off in patches at the slightest touch.

R. C. WROUGHTON.

POONA, *2nd October*, 1899.

No. XXXIII.—BEAR KILLED BY A TIGER.

It is well known that tigers will attack and eat bears on occasion; both Blanford and Sterndale give instances, while in Vol. IX of the Society's Journal may be found two later records by Mr. T. J. Campbell (p. 101) and Mr. P. H. Clutterbuck (p. 229). It may be worth while to note one more such occurrence. Mr. C. E. Spooner, State Engineer, Selangor, tells me that when shooting in Perak, about a month ago, he came upon the body of a full-grown Malay bear which had been killed and half eaten by a tiger. The latter was disturbed at the carcase, and made off with a loud "woof!" escaping unseen. The whole of the bear's hind quarters up to the middle of the body had been devoured, giving the beast the appearance of having been roughly cut in two.

A. L. BUTLER.

SELANGOR MUSEUM, *September*, 1899.

PROCEEDINGS
OF THE MEETING HELD ON 28TH JUNE, 1899.

A meeting of the members took place on 28th of June, 1899, at the Society's Rooms, at which Mr. Ameerudin Tyebjee presided.

NEW MEMBERS.

The election of the following new members was announced:—Mr. P. Hide (Karachi), Mr. J. M. Dick (Bombay), Major C. R. Bartlett, R.A.M.C., F.Z.S. (Jubbulpur), Mr. W. J. Gilbert Cooper, I.F.S. (Moulmein), Major A. J. Abdy, R. A. (Deesa) Mr. Vithaldas Damodar Thakursey (Bombay), Mr. C. W. Wood, P. W. D. (Coimbatore), Mr. J. A. Bourdillon, I.C.S., C.S.I. (Bankipur), Mr. W. E. Rees (Dinapur), Mr. H. F. L. Pink (Dehra Dun), Mr. A. C. Polwhele (Naini Tal), Lieutenant H. A. Carlton (Burma), Lieutenant C. G. Hutchinson (Burma), Mr. John Vernon Cooke (Shikarpur), Mr. R. S. Pearson, I. F. S. (Khandeish), Sir Henry Tichborne, Bart. (London), Mr. L. W. Reynolds, I. C. S. (Allahabad), Mr. A. E. English, I. C. S. (Upper Burma), Mr. J.

McF. Petters (Upper Burma), Dr. William Mitchell (London), Lieutenant G. M. Lennox (Deesa), Lieutenant B. A. Rice (Poona), Captain E. W. Wall (Jhelum), Mr. S. Carr, I. F. S. (Dehra Dun), Lieutenant R. Meinertzhagen (Nusseerabad), Captain T. E. Marshall, R. A. (Quetta), Mr. D. A. Thomson, I. F. S. (Alibag), Mr. S. F. L. Cappel, I. F. S. (Burma), Mess President, 1st South Wales Borderers (Chakrata), Captain P. H. Rogers (Bombay), Dr. C. H. Caley (Bombay), Rev. K. St. A. Rogers (Mombasa), Captain C. Hudson, I. M. S. (Nasik), Mr. Percy Wormald (London), Lieutenant W. H. Chaldecott, R. E. (Sukkur), Mr. Henry Gray (Bombay), Mr. E. W. Beveridge, C. E. (Sirud), Mr. W. G. Peiniger (Chiengmai), Mr. C. W. Hope (London), Mrs. Herbert Cassells (Calcutta), and Mr. L. O. Bowles, C. E. (Shillong).

CONTRIBUTIONS TO THE SOCIETY'S MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions, since the last meeting :—

Contribution.	Description.	Contributor.
1 Snake	*Tropidonotus plumbicolor*..	Col. H. J. W. Barrow, R.A. M.C.
1 Snake	*Callophis trimaculatus*	Do.
1 Fœtal pig	......	Major C. Bartlett, R.A.M.C.
1 Dhaman (alive)	*Zamenis mucosus*	Mr. W. Pegge.
2 Hedgehogs (alive)	*Erinaceus pictus*.............	Mr. F. G Hutchinson.
2 Skulls of Grant's Gazelle.	*Gazella granti*................	Mr. T. J. Spooner.
1 Skull of Hartebeeste. ...	*Bubalis cokei*..................	Do.
2 Feet of Rhinoceros	*Rhinoceros bicornis*.........	Do.
1 Leaf Mantis	*Phyllium scythe*...............	Dr Pearse.
1 Large Racket-tailed Drongo (alive).	*Dissemurus paradiseus*......	Miss A. M. Hewett.
1 Common Grey Hornbill.	*Lophoceros birostris*..........	Mr. W Plunkett.
1 Spotted Owlet	*Athene brama*	Mr. W. D. Cumming.
1 Snake	*Simotes arnensis*.....	Mr. W. P. Clery.
A number of Bats	......	Mr. T. B. Fry, I.F.S.
1 Chameleon (alive)	*Chameleon calcaratus*......	Mrs. Barrett.
5 Jackals (alive)...............	*Canis aureus*..................	Do.
Egg of short-toed Eagle... ..	*Circætus gallicus*............	Lieut. W. A. Payne.
1 Barn Owl	*Strix flammeus*	Mr. W. G. Wilson.
1 Snake	*Zamenis mucosus*	Mr. F. G. Hutchinson.
1 Snake	*Vipera russellii*	Do.
1 Snake	*Silybura phipsonii*...........	Do.
1 Snake	*Oligodon subgriseus*	Do.
1 Snake	*T. piscator*	Do.
A number of Scorpions, Centipedes, Beetles, &c.	......	Do.
1 Porcupine (alive)	*Hystrix leucura*................	Do.
1 Snake..........................	*Naga tripudians (var)*	Major R. H. Rattray.
2 Lizards	*Calotes versicolor (var)*......	Do.
1 Himalayan Pigmy Shrew.	*Crocidura hodgsoni*	Do.
Skin and Skull of the Slender Loris.	*Loris gracilis*	Lieut. H. P. Ainslie.
12 Crocodiles' Eggs	*Crocodilus palustris*	Capt. C. J. R. Milne, I.M.S.
3 Flying Lizards	*Draco blanfordii*	Mr. H Forteath.
2 Snakes	*Psammophis leithii*	Capt. C. G. Nurse.
2 Snakes	*Z. ventrimaculatus*............	Do.

Contribution.	Description.	Contributor.
3 Geckos	*H. leschenaultii*	Capt. C. G. Nurse.
1 Snake	*Typhlops sp*	Do.
1 Black-Crested Baza	*Baza lophote*	Mr. Chas. Gray.
1 Snake	*Silybura ocellata*	Do.
1 Snake	*S. brevis*	Do.
1 Snake	*Trimeresurus anamallensis.*	Do.
1 Snake	*Coluber helena*	Do.
1 Snake	*Xylophis perroteti*	Do.
1 Snake	*Callophis nigrescens*	Do.
1 Snake	*Plectrurus davisonii*	Do.
1 Snake	*Plectrurus perroteti*	Do.
1 Batrachian	*Ichthyophis glutinosus*	Do.
Marine Specimens from Bay of Bengal.	....	Capt. A. R. Anderson, I.M.S
1 Snake	*Gongylophis conicus*	Maj. F. Jencken, R.A.M.C.
Fœtal Specimen of Crocodile.	*Crocodilus palustris*	Capt. C. J. Milne, I.M.S.
1 Lizard (alive)	*Eublepharis macularius*	Mr. C. Glover-Wright.
1 Snake with abnormal plates.	*Tropidonotus stolatus*	Capt. F. Wall, I.M.S.
A collection of Eggs, on deposit.	....	Capt. N F. Wilson, R.I.M.
1 Starred Tortoise (alive)	*Testudo elegans*	Mr. F G. Hutchinson.
1 Yellow-breasted Ground Thrush.	*Pitta brachyura*	Mr. Noel Paton
2 Bats	*Vespertilio pachoytis*	Mr. T. B. Fry. I. F. S.
Photograph of a Monstrosity.	....	Vet.-Major Mills.
1 Common Iora	*Ægithina tiphia*	Lieut. W. A. Payne.
A number of Spiders	*Mygale sp*	Mr Hugh Murray, I.F.S.
1 Bat with young (alive).	*Nycticejus kuhli*	Mr. J. Brand.
1 Hill Mynah (alive)	*Eulabes religiosa*	Mr. F. O. Gadsden.
1 Tree Viper (alive)	*Trimeresurus gramineus*	Mr P. Girhardt.
1 Bear (alive)	*Melursus ursinus*	Col. W. B. Ferris.

MINOR CONTRIBUTIONS :—From Major Hyde-Cates, Colonel Macpherson, Mr. W. J. Little, Mrs. C. Merrony, Mr. E. C. Cholmondely, Mr. T. H. Storey, Mr. W. Tudball, Mr. H. E. John, Mr. Isaac Benjamin, Mr. R. Cox, Mr. F. D. Topham, Captain Phillips, R. N., Mr. C. M. Cursetjee, Dr. C. H. Cayley, Mr. James Marten, Mr. C. H. Donald, Mr. J. Elliott, Major St. J. Richardson, Mr. J. W. Hind, Mrs. F. Hutchinson, Mr. G. Watts, Mr. C. F. S. Stevens, Dr. Pearse, Mr. W. Gonsalves. Mr. H. M. Alexander, Mr. E. C. B. Acworth, Miss Underwood, and Mr. Rivers Currie.

CONTRIBUTIONS TO THE LIBRARY :—The Deep Sea Madrepores collected by the R. I. M. S. Investigator (from the Trustees, Indian Museum) ; Notes on the Therapeutics of Indigenous Vegetables and Drugs, by Dr. B. Dhargalker (from the Author) ; Memoirs of the Geological Survey of India, Vol. XXVIII Part I (from Government) ; Nature, Nos. 1529-37, from Mr. W. F. Sinclair ; Bulletin de la Sociètè Zoologique de France, Vol. XXIII (in exchange) ; Handbook of the Flora of Ceylon, Part IV and plates (Trimen) from the Government of Ceylon ; Transactions of the Entomological Society of London for 1898 (in exchange); The Hymenoptera of the Khasia Hills, by P. Cameron (from the Author); Illustrations de la Flore du Congo (from the Belgian Government); Deep Sea Ophiuroidea (Kochler); (Indian Museum); Indian Museum Notes, Vol. IV, No. 3 (in exchange). The Coccidæ of Ceylon, Part II. (Ernest Green), (from the Author); The North American Fauna, No. 14 (in exchange); The Game Birds of India, Part II, E. W. Oates, (from the Author); and the Journal of the Marine Biological Association of the United Kingdom (from Mr. W. F. Sinclair).

PAPERS READ.

The following papers were then read and discussed:—

1. Fishing in Indian Waters, Part III, by Fred. O. Gadsden, R. I. M. 2. A New Sea Snake, by G. A. Boulenger, F.R.S. 3. Miscellaneous Notes :—(*a*) Food of the Indian Grey Shrike, by Capt. C. G. Nurse. (*b*) Notes on Indian Ducks, by E. H. Young. (*c*) The Courting Dance of the Moonal Pheasant, by Major G. S. Rodon. (*d*) Game in the Waltair District, by Stephen Cox, I.F.S. (*e*) Birds Tapping at Window Panes, by Mrs. Bourdillon. (*f*) Hibernation of Black and Brown Bears, by C. H. Donald. (*g*) Note on the Himalayan Viper, by F. Gleadow, I.F.S. (*h*) A bird killed by a Mantis, by Major C. A. R. Browne, R. E. (*i*) The Palm-swift, by Capt. F. Wall, I. M. S. (*j*) The Red-tailed Chat, by Major R. H. Rattray. (*k*) Note on *Eumenes conica* and *Megachile disjuncta* and their parasites, by Col. C. T. Bingham, I. F. S. (*l*) Jungle Notes, by Capt. R. G. Burton. (*m*) Food of the Hamadryad and Krait, by A. M. Primrose. (*n*) Nesting of the Black Eagle, by W. Mahon Daly.

PROCEEDINGS

OF THE MEETING HELD ON 18TH SEPTEMBER, 1899.

A meeting of the members was held on Monday, the 18th September, 1899, at the Society's Rooms, Mr. E. H. Aitken presiding.

NEW MEMBERS.

The election of the following new members was announced :—Mr. A. L. Dupuis (Ceylon); Lieutenant W. J. H. Hunter (Poona); H. H. the Thakore Sahib of Lathi (Life Member); Capt. H. J. Kelsall, R.A. (Rangoon); Lieutenant C. H. Stigaud (Rangoon); Captain G. F. R. Forbes (Bombay); Mr. John McGlashan, C. E. (Bombay); Mr. C. E. F. Manson (Pyinmana, Burma); Colonel R. O. Lloyd, R.E. (Poona); Mr. Kenneth C. Macdonald (Myingyan, Burma); Mr. J. S. Lambert (Manmar); Miss E. E. Richardson (Bombay); Mrs. C. E. Arthur (Alibag); Major R. W. Wright, R. A. M. C. (Jhansi); Captain C. E. N. Priestley (Rangoon); Captain H. R. Brown, I.M.S. (Chakdara); Mr. A. C. Hankin, C.I.E. (Secunderabad); Mr. C. B. Drake-Brockman (Fort Lungleh, South Lushai Hills); Mr. J. Ghosal, I.C.S. (Alibag); Major Alex. Stables, R.A.M.C. (Poona); Mr. F. A. Constable (New York); Major-General T. B. Tyler, R. A. (Simla); Mr. S H. Pearless (Ceylon); and Mr. Horatio Blair (Hazaribagh, Bengal).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions :—

Contribution.	Description.	Contributor.
Eggs and skin of the Bulbul-Shrike.	*Hypocolius ampelinus.*	Mr. W. D. Cumming.
1 Green Tree-Viper (alive).	*Trimeresurus gramineus.*	Mr. Paul Girhardt.
1 Grass Snake (alive)	*Tropidonotus stolatus*	Do.
1 Brown Tree Snake (alive).	*Dipsas trigonata*	Do.
1 Water Snake (alive)	*Tropidonotus piscator*	Do.
1 Lemur (alive)	*Galago sp*	Mr. Sinclair.
1 Indian Ratel (alive)	*Mellivora indica*	Col. W B. Ferris.
1 White-breasted Kingfisher (alive).	*Halcyon smyrnensis*	Dewan Bahadur V. M. Samarth.
1 Skin and skull of the Jungle Cat.	*Felis chaus (melanoid specimen).*	Mr. W. D. Cumming.
1 Himalayan Viper	*Vipera lebitina*	Do.
1 White-cheeked Bulbul (alive).	*Molpastes leucotis*	Lieut. C. J. Kendal, R.I.M.
1 European Bee-eater	*Merops apiaster*	Do.
1 Cobra (alive)	*Naia tripudians*	Mr. L. Laker.
1 Flamingo	*Phœnicopterus antiquorum.*	Mr. Charles Merrony.
1 Indian Monitor (alive).	*Varanus bengalensis*	Do.
1 Blue-breasted Banded Rail (alive).	*Hypotænidia striata*	Mr. Joe Brand.
1 Young Cobra (alive)	*Naia tripudians*	Mr. L. Fraser.
1 Indian Monitor	*Varanus bengalensis*	Mr. E. W. Beveridge.
1 Hawk (alive)	*Erythropus amurensis*	Mr. David Williamson.
3 Grass Snakes	*Tropidonotus stolatus*	Mr. W. C. Clements.
2 Green Snakes	*Do. plumbicolor*	Do.
1 Phoorsa	*Echis carinata*	Do.
1 Fossil Tooth of the three-toed Horse, found in Bombay.	*Hipparion sp.*	Mr. Fred Swynnerton.
1 Pheasant-tailed Jacana (alive).	*Hydrophasianus chirurgus.*	Mr. W. H. Wolff.
1 Nest of Tickells Flycatcher.	*Cyornis tickelli*	Capt. R. M. Betham.
1 Cobra (alive)	*Naia tripudians*	H. H. the Thakore Sahib of Lathi.
1 Albino Sparrow (alive).	*Passer domesticus*	Mr. A. H. A. Simcox, I.C.S.

Contribution.	Description.	Contributor.
1 Dhaman or Rat Snake (alive).	*Zamenis mucosus*	Mr. N. V. Mandlik.
2 Chamæleons from Africa (alive).	*Chamæleon sp*	Lieut. H. Harrison.
1 Flamingo....................	*Phœnicopterus antiquorum*	Mr. Harrington Bulkley.
1 Krait........................	*Bungarus cæruleus*	Mr. J. D. Field-White.
1 Grey-faced Buzzard Eagle (alive).	*Butastur indicus*	Mr. F. H. Fitzroy.
1 Cheetal or Spotted Deer (alive).	*Cervus axis*....................	Mr. A. H. A. Simcox, I.C.S.
1 Cobra (alive)	*Naia tripudians*...............	Capt. Robertson-Milne.
1 Snake from Aden	*Zamenis ladaccensis*	Mr. C. Baglihole.
1 Snake	*Callophis nigrescens*..........	Mrs. N. C. Pearson.
A collection of Birds' Eggs from Kashmir—		
Green-backed Tit	*Parus monticola*	Lt. N. F. Wilson, R.I.M.
Western variegated Laughing-Thrush.	*Trochalopterum simile*	
Indian Blue Chat	*Larvivora brunnea*	
Indian Great Reed-Warbler.	*Acrocephalus stentoreus* ...	
Rufous-backed Shrike......	*Lanius erythronotus*.........	
Himalayan Starling.........	*Sturnus humii*	
White-browed Blue Flycatcher.	*Cyornis superciliaris*	
Grey-headed Ouzel	*Merula castanea*	
Tickell's Ouzel	*Do. unicolor*................	
The Blue-headed Rock-Thrush.	*Petrophila cinclorhyncha*...	
Hodgson's Pied Wagtail.....	*Motacilla hodgsoni*	
The European Hoopoe......	*Upupa epops*	
The Ruddy Crake	*Amaurornis fuscus*	
The Little Ringed Plover...	*Ægialitis dubia*	
The Little Bittern............	*Ardetta minuta*	

MINOR CONTRIBUTIONS.

Mr. H. Birkenshaw, Mr. J. Sanders-Slater, Master E. Oliver, Mr. N. C. Macleod, Mr. J. B. Neuberg, Mr. H. Brady, Mr. E. W. Beveridge, Mr. C. Hudson, I.C.S., Captain R. F. Standage, I.M.S., Mr. Ardesir B. Kotval.

It was announced that the Indian Ratel from Colonel W. B. Ferris and the Spotted Deer from Mr. A. H. A, Simcox, I.C S., had been forwarded to the Victoria Gardens.

PAPERS READ.

The following papers were read or discussed :—

1. Some Konkan Bats, by Robt. C. Wroughton, C.M.Z.S., Indian Forest Service.
2. Nesting in Cashmere, by Lieut. N. F. T. Wilson, R.I.M.
3. Description of a new *Androsace*, by J. F. Duthie, F.L.S.
4. Fishing in Indian Waters, Part IV, by F. O. Gadsden, R.I.M.
5. A new Hawk (*Astur butleri*, Gurney), by A. L. Butler, F.Z.S.

MISCELLANEOUS NOTES.

(*a*) Food of the Crested Honey Buzzard, by C. M. Inglis.

(*b*) Birds of the Kyauksé District, by Major J. H. Sewell.

(*c*) Notes on the Bulbul-Shrike, by W. D. Cumming.

(*d*) Duration of Parturition in the Daboia, by E. C. Cholmondeley.

(*e*) Occurrence of the Green-billed Shearwater on the Mekran Coast, by W. D. Cumming.

(*f*) The Protective Power of Scent in Animals, by N. C. Macleod.

(*g*) Food of the Indian Wild Boar, by R. M. Nash.

(*h*) Tape Worms found in Fish, by R. M. Dixon.

(*i*) Bison, Tiger, and Wild Dogs, by Major G. S. Rodon.

(*j*) Notes on the White-eyed Duck and the Tufted Duck, by C. M. Inglis.

(*k*) A Plague of Web-making Caterpillars, by W. F. T. Troup.

(*l*) Nesting of the Black Eagle, by Capt. Kenneth Buchanan.

(*m*) Bird-nesting near Poona, by Capt. R. M. Betham.

(*n*) Winter Sleep of Bears, by Major G. S. Rodon.

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Names of New Genera and Species have an asterisk (*) prefixed.

Specific Names are written with a small initial letter; Generic, Sub-family, Family, and Order Names are written with a capital initial letter.

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